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PERFORMANCE AND COST EVALUATION OF BEST AVAILABLE TECHNOLOGY OPTIONS FOR THE ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR

FINAL REPORT

Ontario

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PERFORMANCE AND COST EVALUATION OF BEST AVAILABLE TECHNOLOGY OPTIONS FOR THE ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR - FINAL REPORT

Report prepared by:

Science Applications International Corporation

MINISTRY NOTE

This report was prepared for the Ministry of Environment and Energy as part of a ministry-funded project. The views and ideas expressed in this report are those of the author and do not necessarily reflect the views and policies of the Ministry of Environment and Energy, nor does mention of trade names of commercial products constitute endorsement or recommendation of their use.

References in the report to the Ontario Ministry of the Environment should be taken by the reader to mean the Ontario Ministry of Environment and Energy.

This report was produced as a reference document for the effluent limits development process for the Ontario Organic Chemical Manufacturing (OCM) Sector.

The information presented will be used as a basis for setting effluent limits based on Best Available Technology for each of the Ontario OCM plants.

The report however may not be the sole basis on which limits for the OCM will be developed. Other sources of information, which are acceptable to the OCM Joint Technical Committee, may also be used in the limit setting process.

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CHAPTER 1.0
INTRODUCTION

1.1 BACKGROUND

The Ontario Ministry of the Environment's (MOE) Municipal-Industrial Strategy for Abatement (MISA) program was initiated in 1986 to strengthen the controls on water pollution in the Province. The ultimate goal of the MISA program is the virtual elimination of persistent toxic contaminants from all discharges to Ontario's waterways.

The first phase of the MISA program involved the development of effluent monitoring regulations for nine direct discharging industrial sectors. These regulations required many direct dischargers to monitor flows and contaminants in their point source discharges. These regulations were developed with the Joint Government-Industrial Technical Committee (JTC) for each sector. The second phase will involve the development of effluent limits regulations for each of the nine sectors.

In order to develop effluent limits, pollution control technologies available to the industry for removal of contaminants must be evaluated. Furthermore, the financial and economic impacts of these technologies on the industry must be known. Thus, the best available technology (BAT) economically achievable (EA) for the industry can be determined. Effluent limits will be imposed on contaminants which the BAT(EA) can treat and at levels which BAT(EA) can achieve.

As a first step in undertaking the development of effluent regulations, BAT options must be identified and performance and cost impacts determined. The information will be used by the MOE and the JTC to establish BAT(EA).

To this end, the MOE called for a two phase study to develop an inventory of BAT applicable to plants in the Ontario Organic Chemical Manufacturing (OCM) Sector, as follows:

- **BAT Study** - Development of an inventory of BAT applicable to the Ontario Sector plants, through a search carried out in Canada, U.S., Europe and the Far East, and the prediction of BAT performance and costs, if the recommended BAT options were installed, at the appropriate Ontario OCM plants.

- **Ontario Site Visit Study** - Evaluation of current operations at Ontario OCM plants with respect to manufactoring processes, water usage and effluent treatment.

The results of the two studies are documented in separate reports. The Ontario Site Visit Study is discussed in a report entitled, "BAT Status Site Visit Information Reports for the Ontario Organic Chemical Manufacturing (OCM) Sector"[1].

Information on model BAT technology, its predicted performance and cost for Ontario OCM plants is presented in this report.

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[1] Prepared by SAIC, 411 Hackensack Avenue, Hackensack, NJ 07601, January 1993.

1.2 ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR OVERVIEW

There are twenty-seven plants in the Ontario OCM Sector ranging from small single product operations to large multi-products facilities. Each plant is generally unique in terms of size, products manufactured and wastewater generation and treatment.

Wastewater generated within the industry, by virtue of the products manufactured, contains a number of conventional and priority pollutants. Conventional pollutants found in the Sector include DOC, TOC, COD, volatile suspended solids, ammonia, nitrogen, phosphorus and total suspended solids. Priority pollutants include metals as well as organic contaminants. Industry effluent flows range from less than 5.5 m^3/d to greater than 565,000 m^3/d at individual MISA Control Points.

In-plant controls (e.g., steam stripping) and end-of-pipe wastewater treatment technologies (e.g., activated sludge, granular activated carbon) are currently used by some facilities in the OCM Sector to reduce contaminant loadings to receiving water; some plants provide little or no treatment prior to discharge to receiving waters. Because of this, effluent quality varies widely ranging from priority pollutant levels at or below the regulation method detection limit (RMDL) to milligram per liter.

The majority of the OCM Sector plants are located in three general regions of Ontario: the St. Clair River (Sarnia area); the Lake Erie/Ontario Basin; and the St. Lawrence River. There are other plants located outside these areas in Amprior and Longford Mills.

1.3 STUDY DESCRIPTION AND OBJECTIVES

The overall task was to determine the current operational status of Ontario plants, and to develop BAT options for each OCM Sector facility, where needed, based on the identified technologies or combination thereof at OCM facilities in Ontario, U.S., Europe and Asia. Development of each BAT option for an OCM Site included estimation of effluent concentrations and loadings and an estimate of the costs of installing and operating the equipment.

The specific objectives of the study were:

- To review the current status of the OCM Sector plants with respect to effluent treatment, best management practices, in-plant controls and stormwater management.

- To recommend, where possible, up to five BAT Options for each Ontario OCM Sector plant based on information gathered from Ontario OCM Sector plants and facilities investigated in the BAT study and selected according to the following criteria:

  - A least-cost BAT Option that achieves non-lethality to rainbow trout and Daphnia Magna.

  - The BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S.

  - A BAT Option that uses the best technology currently in use in Ontario.

  - A BAT Option that is predicted to provide the maximum overall contaminant reduction.

  - A BAT Option consisting of any current technology or combination of current

technologies, including supplemental/add-on technologies, or cross-over technologies from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

- To calculate the probable performance of each of the recommended BAT options if installed in the OCM Sector plants.

- To provide order-of-magnitude costs for BAT options judged likely to provide improved performance if installed at each of the OCM Sector plants.

- Where possible, to simplify the above by grouping plants to which similar technologies will apply.

1.4 CONTENTS OF REPORT

Chapter 2.0 describes the study methods used to obtain information on the current status of the OCM Sector plants in Ontario and on identified BAT "sister" plants in U.S. and Europe.

Chapter 3.0 discusses the BAT option selection process, and the costs of the selected BAT option models for each plant.

The underlying costing assumptions and methods are presented in Appendix A.

Individual site detailed BAT Option Reports showing BAT models selected, their performance and costs are included in Appendix B.

CHAPTER 2.0
SITE INFORMATION

2.1 PLANT STATUS

The determination of the status of the OCM plants with respect to current process operations, water management, wastewater treatment, and contaminant discharges encompassed three tasks:

- Review of background material on file with the MISA Office.
- Site visits.
- Preparation of site visit reports.

2.2 REVIEW OF BACKGROUND MATERIAL

2.2.1 Ontario Plant Visits

The purposes of the review of background materials on each of the twenty-seven plants in the sector were:

- To enable study engineers to become familiar with the plants prior to the site visit.

- To develop a list of additional information to be obtained during the site visit.

- To establish existing wastewater management and treatment at the plant.

To identify specific wastewater treatment concerns, data from the draft MISA Six Month Monitoring Data Report was reviewed prior to each site visit.

Information available for review on each plant was contained in files held by the Ontario Ministry of the Environment MISA Office. These were examined by the SAIC and CH2M HILL engineers who were to conduct the site visit at each specific plant. Initial reports filed by each plant during the development of the MISA monitoring regulations provided background information on:

- Plant site layout
- Production processes and process flow diagrams
- Raw materials and products
- General usage materials
- Water conditioning chemicals
- Wastewater sources
- Effluent treatment systems
- MISA sampling locations.

From the initial information review, a list of information requirements was developed and sent in a letter to each plant representative. These letters also confirmed the date and time of the site visit.

2.2.2 Plant Visits Outside Ontario

A similar review was also performed as part of the study to identify candidate plants in the U.S., Europe and the Far East for site visits. Data sources reviewed included:

- the Organic Chemicals, Plastics and Synthetic Fibers (OCPSF) Public Record supporting the 1987 OCPSF Final Regulation promulgated by the USEPA.
- the 1991 SRI International Directory of Chemical Producers for Western Europe.
- the 1990 SRI International Directory of Chemical Producers for the Far East.

Each of the above-mentioned references was reviewed to identify a facility with a product mix similar to an OCM facility. Treatment system information was not available in these references and had to be obtained indirectly from the plants through OCM Sector contacts or through other references.

2.3 SITE VISITS

2.3.1 Ontario Plants

The specific objectives of the Ontario plant visits were:

- To confirm that the information received in the Ministry's information packages was current and complete, and to add any relevant information.
- To identify potential factors that would need to be considered in the implementation of the recommended BAT options at the plant. These could include land area requirements, piping layouts, modifications for retrofitting, process shut downs during implementation, geotechnical conditions, labor and energy requirements, and opportunities and costs of disposing of wastewater treatment residuals.

The dates of the Sector plant visits are shown in Table 2-1 for each of the twenty-seven plants. A representative of the Ministry of Environment participated in each site visit. In some instances, information requests made at the time of the site visit required follow-up over the phone to complete the data gathering.

Generally, site visits took from less than one day for the smaller plants to up to 3 days for the larger, more complex facilities. All visits were carried out in the period of March, April and May 1991.

On-site activities that were carried out by the site visit team with the co-operation of the plant contact person included:

- A tour of the plant.
- Examination of floor plans, piping layouts, etc. of the plant, if available.

- Examination of in-plant records, including in-house operation and performance monitoring, waste disposal records, etc.

- Review of drawings and design summaries for wastewater treatment processes and wastewater control technologies.

- Review of other waste or wastewater control documentation, e.g., best management practice plans, operator's manual, training records, etc.

- Interviews with plant contacts and appropriate plant personnel.

2.3.2 Plants Outside Ontario

Table 2-2 presents the U.S. and European facilities which were identified as site visit candidates. The list of candidate plants was circulated to OCM Sector Points of Contact (POC) to obtain:

- Further information on the plants' product mix.
- Information on the plants' wastewater treatment and waste management systems.
- Permission to visit the plant site.

Since only a limited number of facilities could be visited within the scope of this study, site visit candidates were chosen based on their match of product mix with OCM Sector plants and the timeliness of their response to the request for a site visit. Where the request for a site visit was declined by the candidate site and/or the OCM Sector POC, information was obtained from other sources.

Table 2-3 lists the plants outside Ontario that were visited and the site visit dates. A representative of the Ministry of the Environment or Environment Canada participated in most of the site visits. Generally, site visits took from less then one day for smaller plants to up to 2 days for the larger, more complex facilities. On-site activities that were carried out by the site visit team were similar in scope to those completed for OCM Sector facilities. The Site Visit Reports for the plants outside of Ontario are on file with the Ontario Ministry of the Environment's MISA office.

Review of the site visit candidates identified in Japan (Table 2-4) and corresponding treatment system information obtained from "Environmental Protection in the Industrial Sector in Japan", published by the Industrial Pollution Control Association of Japan, revealed that Japanese chemical facilities generally have the same level of treatment, i.e., secondary treatment with in-plant controls, as plants in the U.S., Ontario and Europe. The only unique feature to Japanese treatment technology is the space-saving nature of the systems installed due to the lack of available land. Biological systems currently being installed are generally of the tower variety similar to those visited at Bayer, Baytown, TX and Dow, Stade, Germany. Therefore, a decision was made not to visit candidate sites in Japan.

2.4 SITE VISIT REPORTS

The information gathered from the Ministry files and the site visits was compiled into an individual site visit report for each plant. The report was organized to present information relevant to the selection and costing of BAT Options.

Each draft site visit report was submitted to the respective plant for review of the correctness and accuracy of information. Comments provided by industry were incorporated into final reports.

The site visit reports are compiled in a report prepared by SAIC entitled "BAT Status Site Visit Information Reports for the Ontario Organic Chemical Manufacturing (OCM) Sector" and are on file at the MISA Office.

TABLE 2-1
ONTARIO OCM SECTOR PLANT SITE VISIT DATES

PLANT	DATE
Akzo Chemicals Ltd.	April 10, 1991
Amoco Canada Resources Ltd.	April 15, 1991
B.F. Goodrich Canada Inc.	April 23, 1991
BASF Fibres - Amprior	April 12, 1991
BASF Canada Inc. - Sarnia	April 25, 1991
Canadianoxy Chemicals Ltd.	April 25, 1991
Celanese Canada Inc.	April 1, 1991
Chinook Group Ltd.	April 9, 1991
Cornwall Chemicals Ltd.	March 22, 1991
Courtaulds Fibres Canada	March 18 & 19, 1991
Dow Chemical Canada Inc.	April 15-17, 1991
Du Pont Canada Inc. - Corunna	April 17, 1991
Du Pont Canada Inc. - Kingston	April 3, 1991
Du Pont Canada Inc. - Maitland	April 8 & 9, 1991
Du Pont Canada Inc. - Whitby	March 1, 1991
Esso Chemical Canada	April 18, 1991
Ethyl Canada Inc.	April 25, 1991
G.E. Plastics Canada Ltd.	March 17, 1991
Guardsman Products Ltd.	March 21, 1991
Morbern Inc.	March 20, 1991
Novacor Chemicals Ltd.	April 16, 1991
Novacor - Styrene I and II	May 30, 1991
Polysar Ltd.	April 23-24, 1991
Rohm and Haas Canada Inc. - Morrisburg	March 21, 1991
Rohm and Haas Canada Inc. - West Hill	March 11, 1991
Stepan Canada	April 26, 1991
Uniroyal Chemical Ltd.	March 27-28, 1991

TABLE 2-2
ORGANIC SECTOR COMPANIES
(ONTARIO/USA/EUROPEAN EQUIVALENT)

ONTARIO COMPANY/SITE	PRODUCT(S)	USA COMPANY/SITE	EUROPEAN COMPANY/ NATION/SITE
Amoco Canada/Sarnia	Liquified hydrocarbons, butane	N/A	N/A
AKZO Chemicals/Sarnia	Fatty Acid Amines	AKZO Chem./Morris, IL	N/A
BASF Fibres/Arnprior	Nylon	(Allied-Chem./Columbia, SC)	(DuPont/Germany/Hamm-Uentrop)
BASF/Sarnia	Styrene-butadiene latex	(Dow Chem./Freeport, TX)	BASF/Germany/Ludwigshafen
B.F. Goodrich/Thorold	PVC & PV Acetate Resins	B.F. Goodrich/Pedericktown, NJ	B.F. Goodrich/Belgium/Antwerpen
Canadianoxy/Ft. Erie	Phenol-Formaldehyde resins	Schenectady/N. Tonawanda, NY	N/A
Celanese Canada/Millhaven	Polyester/industrial yarn	Hoechst Celanese/Spartanburg, SC	(DuPont/Germany/Hamm-Uentrop)
Chinook Group/Sombra	Methylamines & Dimethylformamide	(DuPont/Belle, WV)	N/A
Cornwall Chemicals/Cornwall	Carbon Disulphide & carbon tet.	(Akzo Chemical/Axis, AL)	Akzo subs./Germany/Cologne
Courtaulds Fibres/Cornwall	Rayon fiber, etc.	Courtaulds/LeMoyne, AL	N/A
Dow Chemical/Sarnia	Vinyl Chloride, etc.	Dow Chem./Midland, MI	Dow Chemical/Germany/Stade
DuPont/Corunna	Polyethenes	(Union Carbide/Port Lavaca, TX)	(Dow/Netherlands/Terneuzen)
DuPont/Kingston	Nylon 66	DuPont/Waynesboro, VA	DuPont/Germany/Hamm-Uentrop
DuPont/Maitland	Adipic Acid & HMD	DuPont/Orange, TX	N/A
DuPont/Whitby	Polyethylene/film, etc.	N/A	(Dow/Netherlands/Terneuzen)
Esso Chemical/Sarnia	PVC & BTX & Polyethene	(B.F. Goodrich/Pedericktown, NJ)	N/A
Esso Chemical/Sarnia	PVC & BTX & Polyethene	(Union Carbide/Port Lavaca, TX)	(Dow/Netherlands/Terneuzen)
Ethyl Canada/Sarnia	TEL & Ethyl Chloride	(DuPont/Deepwater, NJ)	N/A
GE Plastics Canada/Cobourg	ABS resins	(Borg-Warner/Washington, WV)	GE Plastics/Netherl./Amsterdam
Guardsman Products/Cornwall	Alkyd & Unsat. Polyester resins	N/A	N/A
Morbern Inc./Cornwall	PVC-coated fabric laminates	N/A	N/A
Novacor Chemicals/Mooretown	Polyethenes	(Union Carbide/Port Lavaca, TX)	(Dow/Netherlands/Terneuzen)

TABLE 2-2
ORGANIC SECTOR COMPANIES
(ONTARIO/USA/EUROPEAN EQUIVALENT)

ONTARIO COMPANY/SITE	PRODUCT(S)	USA COMPANY/SITE	EUROPEAN COMPANY/ NATION/SITE
Polysar/Sarnia	Styrene-butadiene/Styrene/etc.	(Dow Chem./Freeport, TX)	(Dow/Netherlands/Temeuzen)
Rohm and Haas/Morrisburg	Plexiglas and Acryloid	Rohm & Haas/Deer Park, TX	N/A
Rohm and Haas/West Hill	Acrylic emulsions	N/A	Rohm and Haas/Italy/Mozzanica
Stepan Canada	Detergent ethoxylates, etc.	(Rohm & Haas/Deer Park, TX)	N/A
Uniroyal Chemicals/Elmira	Rubber additives	N/A	Uniroyal/Italy/Latina

(company/site) = Matching product/process, different company than in Canada

N/A = None available

TABLE 2-3
GLOBAL OCM SECTOR PLANT SITES VISITED

PLANT	LOCATION	DATE
Dow Chemical	Midland, MI	June 6, 1991
Courtaulds North America	Lemoyne, AL	June 12-13, 1991
DuPont Chambers Works*	Deepwater, NJ	June 27, 1991
DuPont	Belle, WV	July 2, 1991
BASF	Ludwigshafen, Germany	July 15-16, 1991
Akzo Chemicals	Axis, AL	July 23, 1991
Bayer (Mobay)	Baytown, TX	July 24, 1991
Dow Chemical	Stade, Germany	August 26-27, 1991
DuPont-Uentrop	Hamm, Germany	August 28, 1991
Dow Chemical	Terneuzen, Netherlands	August 29-30, 1991

* - Visited Tetraethyl Lead Unit Only

TABLE 2-4
ORGANIC SECTOR COMPANIES
(ONTARIO/JAPANESE EQUIVALENT)

ONTARIO COMP./SITE	PRODUCT(S)	JAPANESE COMPANY
AKZO Chemicals/Sarnia	Fatty Acid Amines	Croda Japan KK Nippon Fine Chemical Co., Ltd.
BASF Fibres/Amprior	Nylon	Dainippon Plastics Co., Ltd. Teijen Limited
BASF/Sarnia	Styrene-butadiene latex	Chiba Butadiene Industry Co., Ltd. Denki Kagaku Kogyo Kabushiki Kaisha
B.F. Goodrich/Thorold	PVC & PV Acetate Resins	Bando Chemical Industries Denki Kagaku Kogyo Kabushiki Kaisha
Celanese Canada/Millhaven	Polyester/industrial yarn	Celanese Japan Ltd.
Courtaulds Fibres/Cornwall	Rayon fiber, etc.	Daiwabo Co., Ltd.
Dow Chemical/Sarnia	Vinyl Chloride, etc.	Dow Chemical Japan Limited Asahi-Penn Chemical Co., Ltd. Chiba VCM Company, Limited
DuPont/Corunna	Polyethenes	DuPont Japan Ltd. Eiwa Chemical Ind., Co., Ltd.
DuPont/Kingston	Nylon 66	DuPont Japan Ltd. Kanebo, Ltd.
DuPont/Maitland	Adipic Acid	None found
DuPont/Whitby	Polyethylene/film, etc.	DuPont Japan Ltd. Eiwa Chemnical Ind., Co., Ltd.
GE Plastics Canada/Cobourg	ABS Resins	None found
Novacon Chemicals/Mooretown	Polyethenes	Eiwa Chemical Ind., Co., Ltd.
Polysar/Sarnia	Styrene-butadiene/Styrene/etc.	Chiba Butadiene Industry Co., Ltd. Denki Kagaku Kogyo Kabushiki Kaisha
Rohm and Haas/Morrisburg Rohm and Haas/West Hill	Plexiglass and Acryloid Acrylic Emulsions	Rohm & Haas Japan K.K. Japan Acrylic Chemical Co., Ltd. Nippon Polyester Co., Ltd.
Uniroyal Chemicals/Elmira	Rubber Additives	Fujikura Rubber Ltd.

CHAPTER 3.0
RECOMMENDED BAT OPTIONS AND ASSOCIATED COMPLIANCE COSTS AND LOADINGS

3.1 SELECTION OF BAT OPTIONS FOR THE ONTARIO ORGANIC CHEMICAL MANUFACTURING SECTOR

In accordance with the study requirements, five BAT Options were identified for the management of wastewater, excluding storm water runoff, discharged from plants in the sector. These options were:

Option 1: - A least-cost BAT Option that achieves non-lethality to Rainbow Trout and Daphnia Magna.

Option 2: - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S.

Option 3: - A BAT Option that uses the best technology currently in use in Ontario.

Option 4: - A BAT Option that is predicted to provide the maximum overall pollution reduction as measured using the U.S. EPA "copper standard" or a near equivalent method of weighting pollutants.

Option 5: - A BAT Option consisting of any current technology or combination of current technologies, including supplemental/add-on technologies, or cross-over technologies from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Based on the results of the Ontario site visits (i.e., Ontario OCM Sector plants with BAT performance employ the same BAT systems and achieve the same performance as U.S. OCPSF plants considered BAT), the global site visits (i.e., the best U.S. and European plants generally employ the same treatment technologies as the best OCM Sector facilities) and the fact that the "copper standard" method of pollutant weighting was taken into account in the OCPSF rulemaking, it was decided to collapse the proposed five BAT Options into a more manageable three BAT Options:

- BAT Option 1 - A least-cost BAT Option that achieves non-lethality to Rainbow Trout and Daphnia Magna.
- BAT Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.
- BAT Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

The discussions below present the rationale for selection of technologies applicable to each OCM Sector Plant. It is important to note that in many instances, technology selection was based not only on the manufacturing processes and existing wastewater management at the Ontario plant, but also on the quality of wastewater effluents. This quality was defined in terms of "Priority 1" pollutants, established by the Ministry from data collected during the MISA Twelve Month Monitoring Period at effluent monitoring stations at each plant. Furthermore, toxicity testing results from the MISA Twelve Month Monitoring Period were utilized to define the toxicity of effluents at each plant.

3.1.1 BAT Option 1

The criterion on which the selection of technologies for BAT Option 1 was based was the achievement of non-lethality of effluents. Lethality was defined by results of acute lethality tests on Rainbow Trout and Daphnia Magna, carried out on full strength wastewater samples according to published protocols. Other toxic and sub-lethal effects were not considered in the definition of non-lethality.

Where the acute toxicity test samples from the MISA Twelve Month Monitoring Period achieved non-lethal results, technologies beyond the existing wastewater management system were not recommended.

Several plants generated wastewaters over the MISA monitoring period that produced lethality to test organisms. Information on the cause of the toxicity was not available. Therefore, MISA monitoring data was reviewed to identify target contaminants potentially contributing to toxicity. A minimum level of technology implementation was then recommended under BAT Option 1 to produce non-lethal levels of the target contaminants. This method did not allow identification of the synergistic toxic effects of several low levels of contaminants, nor did it include technologies to mitigate these effects.

Furthermore, for effluents from a few Ontario plants, the cause of effluent lethality could not be readily evaluated from the available monitoring data. In these cases, no technology recommendation was provided and BAT Option 1 included the recommendation to conduct a Toxicity Identification and Evaluation (TIE) Study.

3.1.2 BAT Option 2

On November 5, 1987, the U.S. Environmental Protection Agency (EPA) promulgated effluent limitations guidelines and standards for the Organic Chemicals, Plastics and Synthetic Fibers (OCPSF) industry which defined best available technology for wastewaters generated by over 900 facilities. In general, biological treatment was selected for the control of conventional pollutants while steam stripping, chemical precipitation, granular activated carbon, alkaline chlorination for cyanide destruction and in-plant biological treatment systems were selected for the control of toxic pollutants. The technical bases for these OCPSF regulations are contained in the technical Development Document[1] and the Public Record supporting the final limitations and standards. Both of these information sources were utilized in selecting BAT Option 2 alternatives for OCM Sector plants.

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[1] Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. (EPA 440/1-87/009, October 1982).

As noted earlier in this section, at the completion of the OCM Sector site visits, it became obvious that the best technologies employed by Ontario OCM Sector plants (and their corresponding performance) were equivalent to those technologies selected as part of the OCPSF rulemaking. OCM Sector plants whose treatment technologies and performance were considered BAT and were used to establish BAT for other OCM Sector plants include:

- Esso Chemicals' carbon contactor effluent (MISA Control Point PR 0200)

- Polysar's BIOX effluent (MISA Control Point PR 1800)

- Amoco's API Separator Effluent (MISA Control Point CO 0100)

These OCM Sector plants along with OCPSF plants identified in the Public Record and visited during the Global Study provided the basis for establishing BAT Option 2 alternatives for the OCM Sector.

3.1.3 BAT Option 3

BAT Option 3 incorporates those current technologies or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. Technologies demonstrated in the U.S. and at certain Ontario facilities which were considered for BAT Option 3 include:

- Granular activated carbon
- Multimedia filtration
- Vapor compression distillation and recycle
- Reverse Osmosis
- Ion exchange

The addition of these technologies will advance the Ontario OCM Sector the furthest toward virtual elimination and the ultimate goal of zero discharge.

3.1.4 Summary of BAT Options

Table 3-1 presents a summary of BAT option models for the purpose of limit setting and compliance cost estimation for the twenty-seven OCM Sector plants. Detailed discussions on the basis for these recommendations are presented in the individual BAT option reports contained in Appendix B. Table 3-2 presents an outline of the individual BAT option reports.

3.1.5 Summary of Estimated Compliance Costs for Recommended BAT Options

Table 3-3 presents a summary of the estimated compliance costs for each of the twenty-seven OCM Sector plants by BAT Option. The individual plant BAT Option Reports in Appendix B contain the detailed cost estimates used to compile this summary.

Total costs for the OCM Sector for each BAT Option are:

	Capital Cost	O&M Cost
BAT Option 1	19,522,300	15,878,400
BAT Option 2	138,884,900	59,234,350
BAT Option 3	732,279,900	129,530,350

3.1.6 ESTIMATING PERFORMANCE OF RECOMMENDED BAT OPTIONS

The following data sources were used to estimate treatment performance for each BAT option:

- OCPSF Public Record (including the Technical Development Document)
- MISA Twelve Month Monitoring Report
- Data obtained during U.S. plant site visits
- EPA-RREL Treatability Data Base (Version 4.0)
- Other MISA Industrial Sector Studies

BAT options reports for each OCM Sector Plant, which are included in Appendix B of this summary report, contain the projected performance data expected for each BAT option and the source of these data. Table 3-4 presents a list of these data sources and the corresponding abbreviations used in the individual BAT option report performance tables.

TABLE 3-1
SUMMARY OF BAT OPTION MODELS FOR THE PURPOSE OF LIMIT SETTING AND COST CALCULATIONS

PLANT #	FACILITY NAME	MISA CONTROL POINT	BAT OPTION 1 (Non-Toxic Effluent)	BAT OPTION 2 (USA/Ontario BAT/Max Red)	BAT OPTION 3 (Virtual Elimination)
# 1	AKZO Chemicals Ltd.	OT 0100	NAT	NAT	NAT
# 2	Amoco Canada Resources Ltd.	CO 0100	NAT	BMP (Molybdenum) and FIL/GAC (Organics)	Same as Option 2
# 3	BASF Canada Inc. Amprior Site	OT 0100	NTT	NAT	FIL/GAC
# 4	BASF Canada Inc. Sarnia Site	OT 0100	NAT	SS (Styrene, Acrylonitrile)	Same as Option 2
		OT 0200	NAT	BMP (oil and grease)	Same as Option 2
# 5	B.F. Goodrich Canada Inc.	PR 0100	NAT	NAT	FIL/GAC
# 6	Canadianoxy Chemicals Ltd.	OT 0100	NAT	FIL/GAC (Phenolics)	Same as Option 2
# 7	Celanese Canada Ltd.	PR 0400	NTT	NAT	FIL/GAC
		CO 0100	NAT	NAT	NAT
		CO 0200	NAT	NAT	NAT
		CO 0300	NAT	NAT	NAT
# 8	Chinook Group Ltd.	CO 0100	TIE	Activated Sludge	Option 2 plus FIL/GAC
# 9	Cornwall Chemical Ltd.	PR 0100	TIE plus Steam stripper for CTC Discharge Trench (1.19 m^3/d) and Steam stripper for CS_2 Effluent (133 m^3/d)	Same as Option 1	Option 2 plus FIL/GAC

NOTE: Specific BAT Options are shown to identify the basis of performance and cost data. The BAT Options are not necessarily the recommended installations for each site.

TABLE 3-1 (Cont'd)
SUMMARY OF BAT OPTION MODELS FOR THE PURPOSE OF LIMIT SETTING AND COST CALCULATIONS

PLANT #	FACILITY NAME	MISA CONTROL POINT	BAT OPTION 1 (Non-Toxic Effluent)	BAT OPTION 2 (USA/Ontario BAT/Max Red)	BAT OPTION 3 (Virtual Elimination)
# 10	Courtaulds Fibres Canada	PR 0100	TIE plus Oil separation/zinc recovery/equalization/steam stripping	Option 1 (w/o equalization) plus primary clarification (CAC)/ equalization/nutrient addition/activated sludge/secondary clarification	Option 2 plus FIL/GAC
		PR 0300	TIE plus Oil separation/ chemically assisted clarification/steam stripping	Option 1 (w/o CAC and steam stripping) discharge to primary clarifier and follow PR 0100 treatment scheme	Option 2 plus FIL/GAC
		CO 0500	NAT	NAT (Elimination of alkaline and acid sewer process discharges)	Same as Option 2
		CO 0600	TIE plus Neutralization	NAT after separating condensate from steam vacuum jets at spin bath evaporators and crystallizers and rerouting to acid sewer for zinc recovery; remaining wastestreams are NCCW	Same as Option 2
		CO 0700	TIE plus Neutralization	Route to biosystem	Same as Option 2
		CO 0800	NAT	NAT after elimination of process discharges to the caravelle sewer; remaining wastestreams are NCCW	Same as Option 2

NOTE: Specific BAT Options are shown to identify the basis of performance and cost data. The BAT Options are not necessarily the recommended installations for each site.

TABLE 3-1 (Cont'd)
SUMMARY OF BAT OPTION MODELS FOR THE PURPOSE OF LIMIT SETTING AND COST CALCULATIONS

PLANT #	FACILITY NAME	MISA CONTROL POINT	BAT OPTION 1 (Non-Toxic Effluent)	BAT OPTION 2 (USA/Ontario BAT/Max Red)	BAT OPTION 3 (Virtual Elimination)
# 11	Dow Chemical Inc.	PR 1200 (to CO 0500)	NTT	FIL/GAC (Dioxins/Furans)	Same as Option 2
		PR 1600 (to CO 0900)	NTT	NEU/SS/FIL	Option 2 plus GAC
		PR 1700 (to CO 0900)	NTT	SS/CP/FIL	Option 2 plus GAC
		PR 2000 (to CO 0900)	NTT	NAT	FIL/GAC
		PR 1900 (to CO 0900)	NTT	Separation and treatment of non-saline wastestreams will reduce flow and pollutant loading to the Biox increasing removal efficiency	EVAP (TDS)
		CO 0200	NAT	NAT	FIL/GAC
		CO 0500	NAT	NAT	NAT
		CO 0600	NAT	BMP (O8CDD)	Same as Option 2
		CO 0700	NAT	NAT	NAT
		CO 0900	NAT	BMP (Zinc)	Same as Option 2
		OT 0300	NAT	NAT	NAT
		OT.1000	NAT	BMP (organics)	Same as Option 2
		PR 2100	NAT	BMP (organics,boron) and oil separation	Option 2 plus FIL/GAC
				Additional streams to be routed into FIL/GAC system are: · WW from Plant #52 (PR 1300) · WW from Plant #62 (PR 1400) · WW from Plant #91 (PR 1500) · CCW from Plant #12 · CCW from Plant #87	Same as Option 2

NOTE: Specific BAT Options are shown to identify the basis of performance and cost data. The BAT Options are not necessarily the recommended installations for each site

TABLE 3-1 (Cont'd)
SUMMARY OF BAT OPTION MODELS FOR THE PURPOSE OF LIMIT SETTING AND COST CALCULATIONS

PLANT #	FACILITY NAME	MISA CONTROL POINT	BAT OPTION 1 (Non-Toxic Effluent)	BAT OPTION 2 (USA/Ontario BAT/Max Red)	BAT OPTION 3 (Virtual Elimination)
# 12	DuPont Canada Inc. Corunna Site	CO 0400 (to CO 0200)	NAT	BMP (O8CDD)	Option 2 plus FIL on both process and contact cooling water streams
		CO 0200	NAT	NAT	NAT
# 13	DuPont Canada Inc. Kingston Site	PR 1000 (to CO 1100)	NTT	Oil separation/equalization/ activated sludge/secondary clarification	Option 2 plus GAC/FIL
		PR 0600 (to CO 1100)	NTT	BMP (Dowtherm)	FIL/GAC
		CO 0700	TIE	BMP (Dowtherm)	Same as Option 2
		CO 1100	TIE	BMP (Dowtherm)	Same as Option 2
# 14	Du Pont Canada Inc. Maitland Site	PR 0300 (to CO 1100)	NTT	Process WW from adipic acid and HMDA to chemical precipitation (copper, zinc) and steam stripping (ammonia) with process WW from cyclohexane oxidation to chemical precipitation only (copper). Secondary clarification and sludge dewatering	Option 2 plus FIL/GAC
		CO 0400 (to CO 0700)	NTT	SS of CFH process WW (tetrachloroethylene and trichlorofluoromethane)	Same as Option 2
		CO 0500 (to CO 1100)	NTT	BMP (organics)	FIL/GAC
		CO 0700 (to CO 1100)	NTT	FIL/GAC	Same as Option 2
		CO 1100	TIE	BMP (copper, TCDD)	Same as Option 2

NOTE: Specific BAT Options are shown to identify the basis of performance and cost data.
The BAT Options are not necessarily the recommended installations for each site.

TABLE 3-1 (Cont'd)
SUMMARY OF BAT OPTION MODELS FOR THE PURPOSE OF LIMIT SETTING AND COST CALCULATIONS

PLANT #	FACILITY NAME	MISA CONTROL POINT	BAT OPTION 1 (Non-Toxic Effluent)	BAT OPTION 2 (USA/Ontario BAT/Max Red)	BAT OPTION 3 (Virtual Elimination)
# 15	DuPont Canada Inc. Whitby Site	CO 0200	TIE	NAT	NAT
		OT 0300	NAT	NAT	NAT
		OT 0400	NAT	NAT	NAT
		OT 0500	NAT	NAT	NAT
		OT 0600	NAT	NAT	NAT
# 16	Esso Chemical Canada	PR 0200 (to CO 0300)	NTT	NAT	NAT
		CO 0300	TIE	NAT	GAC
# 17	Ethyl Canada Inc.	PR 0200 (to CO 0100)	NTT	Process wastewater to oil separation, steam stripping, chemical precipitation and FIL/GAC	EVAP (TDS, Aluminum)
		PR 0300 (to CO 0100)	NTT	· Lamella clarifier overflow to chemical precipitation and multi-media filtration followed by steam stripping. · Lamella clarifier bottoms combined with chemical precipitation sludge slurry to be steam stripped. Bottoms of stripper to equalization tank and belt filter press.	EVAP (TDS, Aluminum)
		CO 0100	TIE	BMP (organics, metals)	EVAP (organics, metals)**
# 18	G.E. Plastics Canada Ltd.	CO 0100	TIE	Bio upgrades	Option 2 plus FIL/GAC
		OT 0400	TIE	Route Wastestream to BIO	Same as Option 2
# 19	Guardsman Products Inc.	OT 0100	NAT	NAT	NAT
# 20	Morbem Inc.	OT 0100	NAT	FIL/GAC	Same as Option 2
# 21	Novacor Chemicals Ltd.	CO 0100	NAT	BMP (TSS)	FIL

NOTE: Specific BAT Options are shown to identify the basis of performance and cost data. The BAT Options are not necessarily the recommended installations for each site.

** Should only be implemented if BMPs fail to control non-process sources of 1,2 dichloroethane; 1,1-dichloroethane, toluene; methylene chloride; aluminum; and TSS

TABLE 3-1 (Cont'd)
SUMMARY OF BAT OPTION MODELS FOR THE PURPOSE OF LIMIT SETTING AND COST CALCULATIONS

PLANT #	FACILITY NAME	MISA CONTROL POINT	BAT OPTION 1 (Non-Toxic Effluent)	BAT OPTION 2 (USA/Ontario BAT/Max Red)	BAT OPTION 3 (Virtual Elimination)
# 22	Novacor Styrene I & II		NAT (OTCW only to Cole Drain)	NAT	NAT
# 23	Polysar Ltd.	PR 0300 (to CO 0200)	NTT	Process wastewater to steam stripping for VOC's removal and chemical precipitation for cobalt and aluminum	Option 2 plus FIL/GAC (Aluminum, Cobalt, Organics)
		PR 0900 (to CO 0400)	NTT	Process wastewater to steam stripping for VOC's removal	Option 2 plus FIL/GAC (Aluminum, Organics)
		CO 0200	TIE	NAT	NAT
		CO 0400	NAT	NAT	NAT
		CO 0500	TIE	NAT	NAT
		PR 1800	NAT	Process wastewater from Halobutyl to steam stripping	Option 2 plus FIL/GAC (Aluminum, Organics)
		OT 1400	NAT	NAT	NAT
		BA 1700	NAT	NAT	FIL/GAC
	Cole Drain*	CO 0100	TIE	GAC	Same as Option 2
# 24	Rohm and Haas Canada Inc.	PR 0200 (to CO 0100)	NTT	NAT	NAT
	Morrisburg Site	CO 0100	NAT	FIL/GAC	Same as Option 2
# 25	Rohm and Haas Canada Inc. Scarborough Site	OT 0100	NTT	BMP (DOC, nitrate)	Option 2 plus FIL/GAC
# 26	Stepan Canada Inc.	PR 0200 (to CO 0100)	NTT	Biological Treatment Upgrades and BMP's (PCBs)	Same as Option 2
		CO 0100	NAT	NAT	FIL/GAC
# 27	Uniroyal Chemical Ltd.	OT 0200	TIE	NAT	NAT
		CO 0800	TIE	BMP (toluene, phenolics)	Same as Option 2
		CO 0900	NAT	FIL/GAC	Same as Option 2

NOTE: Specific BAT Options are shown to identify the basis of performance and cost data.
The BAT Options are not necessarily the recommended installations for each site.

* The Cole Drain serves as a multi plant discharge - monitored by Polysar Ltd.

TABLE 3-1 (Cont'd)

BAT OPTIONS TABLE -- NOMENCLATURE

BMP	= Best Management Practices
CAC	= Chemically Assisted Clarification
CFH	= Chlorofluorohydrocarbons
CP	= Chemical Precipitation
EQ	= Equalization
EVAP	= Vapour Compression Distillation and Recycle
FIL	= Filtration
GAC	= Granular Activated Carbon
NAT	= No Additional Treatment
NCCW	= Once-through non-contact cooling water
NEU	= Neutralization
NTT	= Not Tested for Toxicity
O8CDD	= Octachlorodibenzo-p-dioxin
PCB	= Polychlorinated Biphenyls
SS	= Steam stripping
TCDD	= Tetrachlorodibenzodioxin
TIE	= Toxicity Identification Evaluation
( )	= Parameter shown in ( ) singled out based on site visits and/or monitoring data

TABLE 3-2 OUTLINE OF BAT OPTION REPORTS	
1.0	**PLANT DESCRIPTION** • Description of products, processes and water and wastewater management.
2.0	**WASTEWATER SOURCES AND QUALITY** • Description of wastewater sources including description of MISA Control Points. • Summary of MISA data on flow, quality and loadings obtained from the MISA OCM Sector Six and Twelve Month Report.
3.0	**RATIONALE FOR SELECTION OF BAT OPTIONS** • BAT Options defined. • Discussion of the rationale used in selecting BAT Options. • Summary table of BAT Options.
4.0	**PERFORMANCE DATA FOR SELECTED BAT OPTIONS** • Description of technology, performance and costs of each BAT Option.
5.0	**BAT OPTIONS COST ESTIMATES** • Summary table.
6.0	**REFERENCES**

TABLE 3-3
SUMMARY OF ESTIMATED TOTAL COMPLIANCE COST FOR OCM SECTOR PLANTS[(1)(2)]

Facility Name	BAT Option I		BAT Option II		BAT Option III	
	Capital Cost ($)	O&M Cost ($/year)	Capital Cost ($)	O&M Cost ($/year)	Capital Cost ($)	O&M Cost ($/year)
Akzo Chemicals Ltd.	0	0	0	0	0	0
Amoco Canada Resources Ltd.	0	0	2,239,600	891,700	2,239,600	891,700
BASF Canada Inc. - Amprior	0	0	0	0	2,398,800	1,464,000
BASF Canada Inc. - Sarnia	0	0	2,951,900	18,131,200	2,951,400	18,131,200
B.F. Goodrich Canada Inc.	0	0	0	0	8,902,400	630,200
Canadianoxy Chemicals Ltd.	0	0	769,900	228,800	769,900	228,800
Celanese Canada Ltd.	0	0	0	0	10,004,600	771,800
Chinook Group Ltd.	0	0	657,100	74,100	1,549,900	375,200
Cornwall Chemical Ltd.	1,132,100	337,100	1,132,100	337,100	3,003,000	1,343,200
Courtaulds Fibres Canada	18,390,200	15,541,300	40,648,000	3,572,800	57,842,900	5,230,700
Dow Chemical Inc.	0	0	7,195,700	2,819,000	178,547,900	25,006,600
DuPont Canada Inc. - Corunna	0	0	0	0	2,098,000	133,900
DuPont Canada Inc. - Kingston	0	0	923,700	114,300	4,205,900	1,881,100
DuPont Canada Inc. - Maitland	0	0	63,891,300	21,504,250	96,878,500	24,652,050
DuPont Canada Inc. - Whitby	0	0	0	0	0	0
Esso Chemical Canada	0	0	0	0	32,749,000	3,449,100
Ethyl Canada Inc.	0	0	6,401,700	1,258,800	258,410,800	29,783,900
G.E. Plastics Canada Ltd.	0	0	141,600	10,000	7,641,100	452,500
Guardsman Products Inc.	0	0	0	0	0	0
Morbern Inc.	0	0	2,545,300	1,601,500	2,545,300	1,601,500
Novacor Chemicals Ltd.	0	0	0	0	731,900	63,900
Novacor Styrene I & II	0	0	0	0	0	0
Polysar Ltd.	0	0	6,197,500	7,115,200	47,335,200	11,315,200
Rohm and Haas Canada Inc. - Morrisburg Site	0	0	1,886,200	1,014,300	1,886,200	1,014,300
Rohm and Haas Canada Inc. - Scarborough Site	0	0	0	0	0	0
Stepan Canada Inc.	0	0	11,300	3,200	8,295,600	550,600
Uniroyal Chemical Ltd.	0	0	1,292,000	558,900	1,292,000	558,900
Total	19,522,300	15,878,400	138,884,900	59,234,350	732,279,900	129,530,350

(1) All costs are presented in 1991 Canadian dollars.

(2) Cost estimates do not include the cost associated with Toxicity Investigation Evaluation (TIE) and Best Management Practices (BMP) studies

TABLE 3-4

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
CANOXY	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

APPENDIX A

BAT COSTING

ASSUMPTIONS/METHODS

A.1 BAT COSTING ASSUMPTIONS/METHODS

A.2 ESTIMATING COSTS OF BAT OPTIONS

The primary objective of the Ontario study was to estimate capital and operating costs and the projected performance that would result if each of the three BAT Options were implemented at the twenty-seven Ontario Organic Chemical Manufacturing Sector plants.

The following sub-sections present the general methodologies used to calculate projected compliance costs. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. When cost curves used were based on other than 1991 Canadian dollars, they were adjusted using: (1) the Engineering News Record (ENR) cost indices; e.g., 1982 US dollars to 1991 dollars, multiply by 1.28; and (2) a Canadian dollar to US dollar exchange rate of 1.15. In addition, a 1.3 retrofitting factor was also used to account for cost impacts associated with adding technologies to existing treatment systems. Cost estimates were generated using average flow data from MISA OCM Sector Twelve Month Report; a standard deviation was added to this 12 month average flow to account for flow variations. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, and materials, administrative costs and taxes and insurance.

Cost estimates were developed for the following treatment technologies:

- Biological Treatment (activated sludge/secondary clarification)
- Chemical precipitation
- Chemically assisted clarification (CAC)
- Equalization
- Neutralization
- Multimedia filtration
- Granular activated carbon (GAC)
- Steam stripping
- Vapor compression distillation and recycle
- Biological treatment upgrades
- Sludge handling and disposal
- Oil separation
- Zinc recovery

The sources of the cost estimates associated with the control and treatment of each technology considered under the BAT Options are presented as follows:

Treatment Technology	Source(s) for Cost Estimates
Biological Treatment/Secondary Clarification (small facilities: flow $\leq$ 0.5 mgd)	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Biological Treatment/Secondary Clarification (Large facilities: flow $\geq$ 0.5 mgd)	CAPDET Computer Program
Chemical Precipitation	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Chemically Assisted Clarification	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Equalization	CAPDET Computer Program
Granular Activated Carbon	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Filtration	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Neutralization	CAPDET Computer Program
Oil Separation	Obtained from Vendor Quotes
Steam Stripping	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Sludge Handling and Disposal	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987.
Zinc Recovery	USA Organic Manufacturing Plant with treatment in-place.
Vapor Compression Distillation and Recycle	Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA 440/1-82/024, May 1982.

Cost estimates for the development and implementation of a Best Management Practices (BMP) Plan and Toxicity Identification Evaluation (TIE) studies could not be developed due to the unique nature of each of the sector plants.

The following subsections provide a brief description of each BAT technology with design specifications and associated capital and annual Operating and Maintenance (O&M) cost estimates. Since plant-specific cost estimates were obtained for oil separation and zinc recovery applications, the cost estimation procedures for these technologies are not presented.

A.2.1 Biological Treatment (Activated Sludge/Secondary Clarification)

The Army Corps of Engineers CAPDET computer program was used to design and cost biological treatment systems. For the purpose of representing the costs of large biological systems (> 0.5 mgd), the completely mixed activated sludge process was used.

The use of CAPDET in the preparation of facility plans is encouraged by the U.S. EPA. CAPDET cost estimates are accepted by the EPA with minimum review. Benchmarking and verification of the CAPDET cost estimates revealed that CAPDET cost estimates had been within 15 percent of actual bid data.

The design of the CAPDET program is based on an intensive study of methods and bases of design for each unit. Design and cost data, based on national averages or a base year (1979), are also built into the model as default data and usually need adjustment by the user to reflect time-specific, site-specific and waste-specific conditions more accurately. Another input to the CAPDET program is the description of the wastewater characteristics. This input must include at least the average design flow rate. The program contains built-in or "default" data for all wastewater characteristics. The CAPDET user should specify only wastewater characteristics different from the default values. The default unit cost data used by the program to generate the cost estimates are presented below:

Unit Cost Data	Default (1979 dollars)	Unit
Building Cost	48.00	$/sq. ft
Excavation	1.20	$/cu. ft.
Wall concrete	207.00	$/cu. yd.
Slab concrete	91.00	$/cu. yd.
Marshall & Swift Index	577.00	-----
Crane Rental	67.00	$/hr.
Canopy Roof	15.75	$/sq. ft.
Labor Rate	13.40	$/hr.
Operator II Labor Rate	7.50	$/hr.
Electricity	0.04	$/khr.
Lime	0.03	$/lb.
Aluminum	0.04	$/lb.
Iron	0.06	$/lb.
Polymer	1.62	$/lb.
Hand Rail	25.20	$/ft.
Pipe Installation Labor Rate	14.70	$/hr.
Engin. News Record Index	2886.00	-----
Pipe Cost Index	295.20	-----
Eight Inch Pipe	9.08	$/ft.
Eight Inch Pipe Bend	86.82	$/unit
Eight Inch Pipe Tee	128.49	$/unit
Eight Inch Pipe Valve	1346.16	$/unit

Design parameters used in the CAPDET computer program for the development of cost estimates for large

biological treatment systems were site specific.

Cost estimates for the small biological treatment/secondary clarification systems were taken from the cost curves developed for the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category, EPA 440/1-87/004, October 1987.

To represent the costs of small biological systems (≤0.5 MGD), the extended aeration activated sludge process was utilized by the CAPDET program. The small systems are priced as "package" units, with everything except the foundations and raw pumping stations furnished as a single unit.

The OCPSF design parameters used in the CAPDET computer program for the extended aeration activated sludge system are as follows:

Type of Aeration:	Diffused Aerator
Reaction rate constant:	0.00021 1/mg/hr
Food/microorganism ratio:	0.5
Type of Aeration:	Diffused Aerator
Mixed liquor suspended solids (MLSS):	4,500 mg/l
Mixed liquor volatile solids (MLVSS):	3,100 mg/l
Temperature correction coefficient:	1.03
Effluent BOD_5 soluble:	15 mg/l

The design parameters for secondary clarification used with the CAPDET program are as follows:

Type of Clarifier:	Circular
Solids loading rate:	20 lb/sq. ft./day
Surface overflow rate:	500 g/sq. ft./day
Underflow concentration:	1.0 percent
Specific gravity of sludge:	1.07
Weir overflow rate (maximum):	15,000 g/ft./day
Side water depth:	9 ft.
Detention time:	24 hours
Effluent suspended solids:	15 mg/l

Capital costs were calculated based upon total project costs less miscellaneous non-construction costs, planning costs, technical costs, land costs, inspection costs and interest during construction costs. Operation and maintenance costs were obtained directly from initial year O&M costs. The CAPDET generated costs were adjusted from 1978 dollars (CAPDET default) to 1982 dollars.

In order to benchmark the CAPDET generated cost data, design data were taken from 13 OCPSF plants (Table A-1). In order to check the consistency of the OCPSF plant data used in this analysis, comparisons

were made between reported OCPSF capital costs per gallon of aeration tank size versus flow, and reported costs per 1,000 gallons vs. pounds of BOD_5 removed per 1,000 gallons. There should be a correlation evident from these comparisons; however, there is a considerable amount of scatter in the actual plant data (Table A-2). The capital cost per gallon of tank ranged from $0.10 to $6.25, with an average of $1.99 and a standard deviation of $2.16. O&M costs per 1,000 gallons ranged from $0.46 to $7.12, with an average of $2.33 and a standard deviation of $2.30. Therefore, the reported plant data may contain costs that should not be taken into account in EPA's analysis. For example, a plant may have included its plant expansion as part of other improvements at the site. However, the plant's accounting system may not allow for the breakout of the costs in sufficient detail for direct comparison to EPA's estimates. For example, a plant may choose to upgrade its sewer system or road network near the treatment plant. It may account for these construction activities as part of "treatment plant capital improvement project."

Some plants may use waste steam or spent chemicals from the plant process units in the treatment system. If the plant does not account for these as costs to the treatment system, they may report unusually low O&M costs. Therefore, actual reported costs can be expected to vary widely around EPA's calculated costs.

Table A-3 presents the comparison between reported plant capital and O&M costs and the costs calculated by CAPDET in 1982 dollars. Table A-4 presents a comparison of reported and CAPDET-calculated detention times.

Although the individual plant cost comparisons vary greatly, for the reasons noted earlier, CAPDET's total capital costs for the sum of all the plants are close to (15% higher) the reported total capital costs incurred. Even though there are differences in design (CAPDET designs concrete tanks whereas some plants use more costly steel tanks or less costly earthen basins with or without liners), EPA concluded that its cost estimates accurately reflect expected costs that will be incurred by compliance with its regulation.

Table A-5 details the individual components of the aggregated O&M costs presented in Table A-3. An investigation of the individual O&M costs showed that reported operating labor costs were higher than CAPDET default value labor costs in every case, by factors ranging up to 15 times CAPDET costs. Similarly, maintenance labor costs differed by factors ranging up to 14 times CAPDET default value costs. Follow-up telephone calls to the plants in question revealed the reasons for the major differences. The labor rates submitted in the supplemental questionnaires included fringe benefits such as workmen's compensation, FICA, vacation, etc. The fringe benefits are generally between 25 to 40 percent of total labor costs. Other plants also included overhead and overtime in their labor rates. One plant's labor rates were based on annual costs for operating the entire treatment plant rather than just the activated sludge system. Table A-6 shows that the operation man-hours reported for the 5 plants listed ranged form 3 to 11 times the predicted CAPDET values. However, reported maintenance man-hours varied little from CAPDET for small facilities (≤0.50 MGD).

The data in Table A-5 show that CAPDET's estimates for the non-labor O&M costs are close to the reported values. Again, a particular plant's reported values may be unnecessarily high due to accounting features, as discussed earlier. However, EPA believed that an adjustment to its labor rates was necessary, as follows. Table A-7 presents the reported operating and labor rates for nine plants. These rates were adjusted as a result of follow-up telephone calls made to the individual plants and provide an overall average labor rate (that generally includes fringe benefits, overhead, etc. but excludes unrelated expenses) of $19.77/hour (1982 dollars). These data were used to adjust the CAPDET default labor rate to

$15.57/hour (1979 dollars). Power and material costs also differed, but not as dramatically as the labor costs.

The CAPDET algorithm was also benchmarked against actual capital and O&M costs obtained from three OCM Sector plants. Table A-8 presents the CAPDET estimated capital and annual operating costs and the plant reported costs for the three OCM facilities. In general, the cost estimates matched the reported costs fairly closely.

Since the cost estimates are presented in 1982 US dollars, they were adjusted by a factor of 1.28 to represent 1991 dollars and a factor of 1.15 to convert US dollar to Canadian dollars. Finally, a retrofitting factor of 1.3 was also included for the capital costs.

The adjusted capital and O&M cost estimates used to estimate compliance costs for the Ontario OCM Sector plants with flows below 0.5 MGD are presented in Table A-9. For OCM Sector plants with flows greater than 0.5 MGD, plant-specific CADPET runs were performed.

A.2.2 Chemical Precipitation

Cost estimates for chemical precipitation were also taken from the Development Document for Effluent Guidelines and Standards for the OCPSF Industry (EPA, 1987). These costs are based on sulfide precipitation which was reported as very effective in removing complexed metals at low levels versus the conventional hydroxide precipitation technology.

The chemical precipitation treatment system train presented in the above document includes coagulation, flocculation and clarification. Cost estimates were developed using a conservative gravity clarifier with design overflow rate of 400 gpd/ft^2 and residence times for sizing the rapid mix tanks (coagulation) and flocculation tanks of 2 minutes and 20 minutes respectively. The estimated process equipment and material costs were obtained from a manufacturer (Envirex). Capital cost estimates also include contingencies, overhead field labor, field construction equipment, materials and tools. For the annual operating and maintenance (O&M) cost estimates, a polymer dosage rate of 1.0 mg/l has been assumed. The ferrous sulfide dosage rate was determined by the actual stoichiometric requirements of the selected reaction. Ferrous sulfide dosage rates of two times the stoichiometric requirements were assumed. The annual maintenance costs were assumed to be 4 percent of the total capital costs. Tax and insurance costs were assumed to be 2 percent of the capital cost. Finally, a unit electricity cost of $0.08/kwh was used.

A benchmark analysis was performed to compare the chemical precipitation system cost estimates with reported industry experience. Appropriate cost data were available from the Section 308 Questionnaires for seven OCPSF facilities. The wastewater flow rates of these facilities range from 0.58 to 7.5 MGD, falling well within the costing curve flow range. All the capital costs were converted to 1982 dollars using ENR's Construction Index. The results are presented in Table A-10.

In general, although there are differences in the cost comparisons between EPA's estimates and actual industry data, there is no definitive pattern to the differences in either magnitude or direction. From Table A-10, approximately 86 percent of the total facilities are estimated to have cost differences within ±60 percent. As shown in Table A-10, the reported capital cost for Plant No. 2181 seems to be unusually high compared to other facilities with flow rates several times that of Plant No. 2181. In contrast, the reported capital cost for Plant No. 683 seems to be significantly lower than that of other facilities with flow rates lower than that of Plant No. 683. This probably indicates that both plants may have introduced some design specifications that were different from typical values. Except for these two plants, the remaining plants shown in Table A-10 seem to follow the plant reported cost data.

Although a certain degree of discrepancy exists, variations between reported systems and EPA's estimates are judged to be within the acceptable range normally associated in industrial practice for preliminary engineering cost estimation.

Since the cost estimates presented in the above document were reported as 1982 U.S. dollars, they were adjusted by a factor of 1.28 and 1.15 to represent 1991 Canadian dollars. A retrofitting factor of 1.3 was also assumed for the capital cost estimates. The resulting cost estimates for the chemical precipitation treatment systems used to obtain cost estimates for the Ontario OCM Sector plants are presented in Table A-11.

A.2.3 Chemically Assisted Clarification

Cost estimates for the Chemically Assisted Clarification (CAC) systems were obtained from the U.S. EPA study for the OCPSF Industry (EPA 440/1-87/009, October 1987). According to that document, cost estimates for CAC systems were derived from an Environmental Science and Engineering, Inc. costing methodology prepared for the pesticides industry. Components of the clarification system include concrete clarifiers, sludge pumps, polymer tanks, and polymer feeders. The clarification system also includes site work, electrical, piping and instrumentation. The estimated equipment costs for sludge removal system, pumps, polymer feeders, and polymer storage tanks were obtained from manufacturer's quotes. Engineering and contingency costs were each assumed to be 15 percent of construction costs. Annual operating costs were estimated based on energy, chemicals, labor, maintenance and taxes and insurance. The estimated annual energy costs were based on manufacturer's recommendations on motor-horse power for sludge removal mechanisms, pumps, and polymer feed systems, plus control and lighting requirements. Taxes and insurance costs were assumed to be 2 percent of the total capital costs while maintenance costs were taken to be 4 percent of the total capital.

A benchmark analysis was performed to compare the cost estimates with OCPSF plant installations. Based on the Section 308 Questionnaires, 21 OCPSF plants were selected that had provided capital costs information on their primary or secondary clarifiers. The costs were converted to 1982 dollars using the ENR Construction Index. The results are presented in Table A-12. The wastewater flow rates under study range from 0.14 to 7.5 MGD. In general, although there are differences in the cost comparisons between EPA's estimates and the industry plants, there is no definitive pattern to the difference in either magnitude or direction. Approximately 67 percent of the facilities (or 14 plants) have cost differences within ±80 percent. However, four out of the 21 facilities show extremely high discrepancies with percent differences greater than 100 percent.

Due to the lack of detailed design information from the Section 308 Questionnaires, a larger number of unknown site-specific factors may exist, thus affecting the cost comparison. For example, critical design parameters such as overflow rate, detention time, type of tank used, weir loading rate, and chemical feed systems, etc., were all unavailable for the estimates. This may be the major reason why some significant discrepancies exist. Potential cost estimate differences may be introduced further by the geographical locations of the facilities. In addition, differences between the actual construction costs of the treatment systems and the conversion of such costs into 1982 dollars most likely contributes to these discrepancies. Despite some of the large discrepancies, EPA's cost estimates have been judged to be acceptable, considering the unknown factors and the possible cost estimating procedures which may vary significantly from one company to another.

Based on the benchmark analysis, it is concluded that EPA's cost estimates on clarification systems are within a reasonable range normally associated with actual industrial practices.

In obtaining cost estimates for the Ontario OCM Sector the cost estimates from the above reference were adjusted to 1991 dollars (1.28) using ENR's construction index. In addition, a factor of 1.3 was applied to capital cost for retrofitting and finally a factor of 1.15 was used to convert U.S. dollars to Canadian dollars. The resulting cost estimates for the CAC Treatment Systems are presented in Table A-13.

A.2.4 Equalization/Neutralization

The CAPDET computer program was utilized to obtain cost estimates for equalization and neutralization treatment systems. The capital equipment cost was obtained directly from the CAPDET computer run. Engineering and contingencies were taken at 25 percent each of the capital equipment cost. The annual operating costs are taken directly from the computer runs and include operating and maintenance labor, chemicals, materials, power and energy, taxes and insurance.

The design parameters used in the CAPDET program for the development of cost estimates for equalization and neutralization are as follows:

Equalization Design Parameters:

O_2 transfer in waste/O_2 transfer in water:	0.9
O_2 saturation in waste/O_2 saturation in water:	0.9
Aerator mixing requirements:	0.03 hp/1000 gallons
Standard transfer efficiency:	5.0 lb O_2/hp-hr
Oxygen requirement:	15 mg/l/hr
Pressure correction coefficient:	1.0
Dissolved oxygen:	2.0 mg/l
Type of basin:	earthen w/liner
Depth of basin:	6.0 feet

Neutralization Design Parameters:

Buffer capacity:	0.1 lbs/gal
Degree of mixing:	0.3 hp/1000 gallons
Mixing time:	5 minutes

Since the CAPDET's default values represent 1978 cost data the cost estimates obtained from CAPDET were adjusted by a factor of 1.8 to represent 1991 dollars. A factor of 1.3 was also applied to capital costs for retrofitting and finally a factor of 1.15 was used to convert U.S. dollars to Canadian dollars.

A.2.5 Filtration

Cost estimates for the filtration systems were taken directly from the Development Document for Effluent Guidelines and Standards for the OCPSF Industry (EPA 440/1-87/009). The CAPDET computer program was used to develop these cost estimates. It should be noted that the CAPDET computer program uses a "package" system for economical reasons when the required filter surface area is less than 400 ft^2 (flow ≤2.0 MGD). For large plants with required surface areas of greater than 400 ft^2 (flow >2.0 MGD), filters with concrete wall construction are always used.

The filtration system specifications used in the CAPDET to develop the cost data are as follows:

Media Used	Layers	K	POR	D/A	SF	SG
Anthracite	1 layer	6	0.50	0.0046	7.0	1.4
Sand	1 layer	5	0.40	0.0020	8.5	2.65
Garnet Sand	1 layer	4	0.47	0.0010	8.0	2.65
Gravel	1 layer	6	0.60	0.050	6.0	2.65

where,

K = Coefficient of Permeability
POR = Porosity
D/A = Particle Diameter (ft)
SF = Shape Factor
SG = Specific Gravity

Other filtration system specifications used in the CAPDET program include:

Influent Suspended Solids	40 mg/l
Effluent Suspended Solids	5 mg/l
Filtration rate	4 gpm/ft^2
Backwash rate	20 gpm/ft^2
Depth of Filter Bed	9 ft
Approach Velocity	0.005 ft/sec
Backwash time	10 minutes

Again, since the cost estimates provided in the above document were reported as 1982 U.S. dollars the same factors were used to adjust the cost to 1991 Canadian dollars. The resulting cost estimates for the filtration units used to provide the cost for the Ontario OCM Sector plants are on Table A-14.

A.2.6 Granular Activated Carbon

Cost estimates for activated carbon treatment units were taken from the U.S. EPA study for the OCPSF Industry (EPA 440/1-87/009, October 1987). The end-of-pipe low carbon adsorption capacity design treatment was used. According to that source, the cost estimates for activated carbon treatment systems were divided into two categories: large systems (flow ≥0.5 MGD) and small systems (flow ≤0.5 MGD) based on the requirements of on-site carbon regeneration systems. For the large systems where on-site carbon regeneration systems are included, a modified version of the CAPDET computer costing algorithm was used for development of both capital and annual operating costs. For the small systems, where off-site carbon regeneration systems are generally used, the costing methodology developed by Environmental Science and Engineering, Inc. (ESE) for the pesticide industry was modified and used for the OCPSF industry.

For the development of activated carbon treatment capital and operating costs, for the large facilities, the CAPDET program makes use of the following design parameters:

- Flow rate
- Influent waste characteristics
- Desired effluent quality
- Empty bed residence time (EBRT)
- Activated carbon usage rate
- Operation and maintenance requirements
- On-site or off-site thermal regeneration.

The following design parameters were used for the development of capital and O&M cost estimates for large facilities (flow ≥0.501 MGD):

Adsorber capacity	0.005 lbs of pollutant/lb of carbon
Empty bed residence time	45 minutes
Furnace loading rate	120 lb/d/ft^2
Effluent TTO (Total Toxic Organics)	<0.005 mg/l
Influent TTO	10 mg/l

One of the controlling factors in determining capital and annual operating costs is carbon adsorption capacity defined as pounds of pollutants adsorbed per pound of carbon used. For plants requiring more than 400 lbs/day of carbon, the CAPDET model also requires the installation of on-site carbon regeneration systems, which increases the capital costs significantly. When the carbon consumption rate is less than 400 lbs/day, no on-site regeneration is required. The CAPDET model assumes a default value of 0.5 lb COD/lb carbon for design. This is considerably higher than those for the removal of organic chemical compounds.

Generally, the carbon adsorption capacities for specific organic compounds are dependent upon their molecular structure, molecular weight, and solubility. The nonpolar, high molecular weight organics with low solubility have been found to be preferentially adsorbed. In contrast, polar, low molecular weight organics with high degrees of solubility tend to be poorly adsorbed. In addition, pH, temperature, and carbon types/pore sizes also affect adsorption capacity.

In 1980, EPA conducted comprehensive isotherm testing on 128 organic compounds using consistent experimental techniques.

For the end-of-pipe systems, the adsorption capacity for each specific organic priority pollutant was

obtained directly from isotherm curves of the EPA study at an effluent level of 0.005 mg/l total toxic organics. The pollutants were then divided into two groups (medium and low) as shown in Table A-15. (For OCM Sector plants, only the low adsorbability group was used.)

As plant flow decreases, installation of on-site carbon regeneration systems becomes less economical. For that reason the small system (flow <0.5 MGD) costs were derived by modifying ESE's carbon system costing methodology prepared for the pesticide industry; major adjustments included an empty bed residency time of 45 minutes for adsorber design.

A summary of the CAPDET design specifications (large flow systems) for the end-of-pipe carbon treatment systems is presented in Table A-16. The design dimensions and number of carbon units for all the 20 MGD flows were adjusted to make the height to diameter ratio more reasonable. Since the furnace size and the carbon column volume remain unchanged, the capital cost increase is considered insignificant.

The cost estimates presented were adjusted to represent 1991 dollars (factor of 1.28). A factor of 1.3 was also included in the capital cost for retrofitting and finally a factor of 1.15 was used to convert U.S. dollars to Canadian dollars.

The final cost estimates for the granular activated carbon systems used to obtain capital and O&M costs for the Ontario Sector plants are presented in Table A-17.

A.2.7 Steam Stripping

The cost estimates for steam stripping for the Ontario OCM Sector plants were taken from the U.S. EPA study of the OCPSF Industry. According to the Development Document for Effluent Guidelines and Standards for the OCPSF Industry (EPA, 1987), the cost estimates for the steam stripping process were developed by the Water General Corporation, Process Design Manual for the Stripping of Organics, EPA 68-03-3002, October 1983.

Steam stripping is an energy-intensive technology in which heat energy (boiler capacity) is required to both preheat the wastewater and to generate the superheated steam needed to extract the volatiles from wastewater. Steam strippers are designed to remove individual volatile pollutants based on a ratio (Henry's Law Constant) of their aqueous solubility (tendency to stay in solution) to vapor pressure (tendency to volatilize).

Twenty-three plants with steam stripper data from the Supplemental 308 Questionnaires were reviewed, and their influent and effluent concentrations tabulated. Table A-18 presents the data. Only those plants removing priority pollutants from their wastewater were included in the survey. An assessment of the 1983 Supplemental Questionnaire data provided median influent and effluent average concentrations of 390 and 2.3 mg/l, respectively. However, EPA sampling study data have shown that OCPSF steam strippers can achieve effluent concentrations as low as the analytical minimum level for many pollutants.

According to the Section 308 Questionnaire data base, eight OCPSF plants report using air stripping and 82 report using steam stripping as an in-plant treatment technology. Steam stripping performance data collected during the EPA 12-Plant Study or submitted by industry for selected volatile organic compounds are presented in Table A-19. The data indicate that high removal efficiencies (e.g., most plant-pollutant combinations are over 99%) can be achieved for these volatile organic compounds.

The column height and diameter, amount of packing or number trays, the operating steam pressure, and temperature of the heated feed (wastewater) are varied according to the strippability (using Henry's Law Constant) of the volatile pollutants to be stripped. Volatiles with lower Henry's Law constants require greater column height, more trays or packing material, greater steam pressure and temperature, more frequent cleaning, and generally more careful operation than do volatiles with higher strippability. Table A-20 presents the high and medium strippability pollutants to be controlled by steam stripping. (For OCM Sector plants, steam stripping cost estimates were always based on the medium strippability group.) Steam stripping cost estimates are based on the design of a tray tower since it was determined that sieve-tray towers operate more efficiently and over a wider range of liquid flow rates.

OCPSF design values assigned to the steam stripper variables for the medium strippability pollutants are presented in Table A-21. These were obtained by reviewing design values reported in the Section 308 questionnaires.

In addition to volatile pollutant removal, steam stripping was proven effective for in-plant control sulfide treatment[1,2]. A pilot study performed showed that steam stripping reduced influent concentrations of

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[1] Science Applications International Corporation, "Best Available Treatment Technology for the Petroleum Refining Sector", Prepared for the MISA Petroleum Refining Sector Joint Technical Committee, Final Report (August 1991).

[2] Cameron, R.D. 1979. The Design and Commissioning of the Wastewater Treating Systems at Texaco's Nanticoke Refinery. Texaco, Nanticoke, Ontario, June 1979.

sulfide from 900 mg/l to about 0.2 mg/l.

To provide a basis for the development of steam stripping costs, data were extracted from the Supplemental 308 Questionnaires submitted by those facilities utilizing steam strippers on their waste streams (see Table A-22). The capital and O&M costs taken from the Questionnaires were scaled up to 1982 using the appropriate Engineering News Record indices. Where installation costs were not provided, they were assumed to be 50 percent of the capital costs.

Capital costs include feed tanks (approximately 24-hour detention time), preheated, distillation column, condenser, decanter and pumps. The operating costs include operation and maintenance labor, maintenance materials, steam energy, and electricity.

In addition to these costs overhead disposal costs were also considered for the final estimates for the steam stripping technology. Based on manufacturer's information, this overhead waste stream flow is estimated to be 1 (one) percent of the total waste stream flow. Estimates of the cost incurred for the disposal of stream stripper overhead were developed based on vendor quotations.

For overhead waste flows of 1,000 gpd or greater, on-site incineration of the steam stripper overhead waste is the most economically practical solution. Prices for hazardous waste incinerators were solicited from manufacturers and were used as a basis for the capital cost estimates. The operating costs were estimated based on fuel oil consumption, labor costs, and an annual parts and maintenance budget of 10 percent of the capital cost.

To apply the steam stripping overhead disposal cost estimates to the costing methodology, ratios were derived between the steam stripper costs generated via the computerized design program and the overhead estimates that were developed via vendor quotations for contract hauling and incineration.
These ratios are as follows:

Overhead Capital $ = 0.55 (Steam Stripper Capital $)
Overhead O&M $ = 0.62 (Steam Stripper O&M $)

To obtain steam stripping cost estimates for the Ontario OCM Sector plants, the total steam stripping costs reported in the OCPSF Development Document (including the overhead disposal costs) were used.

Again, a factor of 1.28 was applied to convert 1982 to 1991 dollars and a factor of 1.15 was also applied to convert U.S. dollars to Canadian dollars. Retrofitting costs were taken to be 1.3 of total capital costs, where applicable.

The final steam stripping cost estimates used to cost the Ontario OCM Sector plants are presented in Table A-23.

A.2.8 Vapor Compression Distillation and Recycle

Certain BAT Option 3 (virtual elimination) cost estimates for the Ontario OCM Sector are based on vapor compression distillation and recycle. Cost estimates for this treatment technology were taken directly from the Development Document for Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (EPA, 1982).

Since these costs were reported in 1978 dollars, they were adjusted by a factor of 1.8 in order to present 1991 dollars and by an additional factor of 1.15 to represent Canadian dollars. In addition, a retrofitting factor of 1.3 was applied to capital costs. The cost estimates for this technology are presented in Table A-24.

A.2.9 Biological Treatment Upgrades

The cost estimates for upgrading biological treatment systems for the Ontario OCM Sector plants were taken from the EPA study of the OCPSF Industry (EPA 440/1-87/004, October 1987).

Based on the Section 308 Questionnaires, a large number of OCPSF plants use biological treatment to control BOD_5 and other conventional pollutants in their effluent waste streams. Many of these plants were built in the early 1970's, and were designed to meet present permit limitations based on best professional judgment, which may be less stringent than the BPT limitations. As such, these plants cannot meet BPT limitations without certain system modifications or upgrades. The purpose of the bio-upgrade costing procedure was to develop costs for plants that require only moderate improvements.

According to this study, approaches to upgrading biological treatment units include adding unit treatment processes, modifying the design and operational parameters of existing units, acclimating existing bacteria to certain toxicants or using bioaugmentation (the addition of acclimated types of bacteria bred to remain active under a variety of adverse conditions), particle size reduction, nutrient addition, and the addition of powdered activated carbon (PAC) to aeration units.

Table A-25 presents the projected capital and operation and maintenance costs for upgrades to the existing activated sludge systems at the five facilities utilized in the capital cost analysis as measured by incremental BOD_5 removal improvements. For OCM Sector facilities, incremental COD/DOC/TOC removal improvements were substituted for BOD_5 removal.

Since the cost estimates presented in the above document were reported as 1982 U.S. dollars they were adjusted by a factor of 1.28 and 1.15 to represent 1991 Canadian dollars. A retrofitting factor of 1.3 was also assumed for the capital cost estimates.

A.2.10 Sludge Handling and Disposal

Sludges are generated by the biological treatment system recommended for Ontario OCM Sector plants. Therefore, the cost for sludge treatment and disposal must be part of the biological treatment costs. The cost estimates for the sludge treatment are based on using a belt filter press for sludge dewatering and landfilling as the final disposal. Cost estimates for sludge dewatering were obtained directly from the cost estimates developed by the U.S. EPA OCPSF study.

To estimate the capital costs of belt filter press systems, certain assumptions were made prior to sizing the equipment. These include the following design characteristics:

- Long-Term Average Influent TSS to the End-of-Pipe Treatment System = 200 mg/l
- Average Feed Sludge Total Solids = 2%
- Filter Press Discharge Cake Solids Concentration = 20%
- Belt Filter Press Design Loading Rates (recommended by Komline-Sanderson Engineering Corporation):

  Solids Loading Rate = 500 lbs/hr/meter
  Hydraulic Loading Rate = 45 gpm/meter

- Belt Filter Press Operating Time = 8 hrs/day.

Table A-26 presents a summary of the design specifications and equipment size for wastewater flow rates ranging from 0.5 to 20 MGD.

The estimated equipment costs, which include belt press units, sludge feed pumps and polymer feed systems, were obtained directly from manufacturers' recommendation (Komline-Sanderson Engineering Corporation). Costs for conveyors, piping, and instrumentation were assumed to be 20 percent of the total equipment costs. The installation costs were taken to be 50 percent of the total equipment costs. Both the engineering and contingency costs were each assumed to be 15 percent of the total construction costs. The final capital costs were converted to 1982 dollars using the ENR Construction Index.

Annual operating costs were estimated based on energy, chemicals, labor, maintenance, tax and insurance requirements. The estimated annual energy costs were based on manufacturers' recommendations of motor horsepower requirements for each system. A unit electricity cost of $0.08/kwh was used for estimating energy costs. The unit labor costs were based upon EPA's Treatability Manual at $24,500/man-year for labor and $34,600/man-year for supervision. Annual chemical costs for sludge conditioning were estimated from manufacturers' recommendations at a polymer cost of $5.00/ton dry sludge. The annual maintenance costs were taken to be 4 percent of the total capital costs. Taxes and insurance costs were assumed to be 2 percent of the total capital costs. The final operating costs were converted to 1982 dollars using ENR's Construction Index.

Since the final cost estimates presented in the USEPA study were reported as 1982 U.S. dollars, they were adjusted by a factor of 1.28 to represent 1991 dollars. A factor of 1.15 was used to convert U.S. dollars to Canadian dollars and finally a factor of 1.3 was used for the capital cost only to account for retrofitting. The resulting cost estimates for sludge dewatering treatment systems were used to obtain cost estimates for the Ontario OCM Sector plants and are presented in Table A-27.

Cost estimates for landfilling for the small treatment systems (flow $\leq$ 0.5 MGD) were not included. For large biological treatment systems, the cost estimates for landfilling were taken directly from the CAPDET runs.

TABLE A-1
ACTIVATED SLUDGE
TABLE OF REPORTED "308" QUESTIONNAIRE DATA

Facility Questionnaire Number	Flow (MGD)	Detention Time TD (day)	K_m (1/mg/hr)	S_o (mg/l)	S_e (mg/l)	TSS_i (mg/l)	TSS_e (mg/l)	Temperature (°C)	MLSS (mg/l)	MLVSS (mg/l)
500	0.720	15.0	0.000063	2,209	17.5	8,000	40	23.6	6,250	5,500
525	1.50	1.0	0.000027	65	18	100	43	10	6,000	4,000
662	6.48	3.0	0.000075	1,300	93	600	50	17	3,081	2,400
908	1.40	6.0	0.000024	4,280	291	514	233	27	5,000	4,000
1343	0.374*	2.8	0.210	307	20	100	25	13	N/A	2,500
1349	0.501	0.26	0.00058	720	72	1,000	100	16	2,800	2,500
1609	1.5	1.0	0.0001	1,920	192	1,300	100	38	5,000	3,700
1695	1.84	0.57	0.00019	215	42	101	36	32	N/A	2,500
1766	0.432*	3.0	0.260	1,750	90	625	150	10	N/A	3,000
2626	0.865	9.0	0.000026	350	20	1,800	25	20	4,000	3,000
2631	9.40	1.5	0.00027	1,125	27	840	48	31	5,000	4,250
2701	0.144*	2.0	0.062	1,000	250	0	250	25	N/A	3,500
2536	3.6	1.2	0.0037	713	14	100	15	26.0	2,160	2,000

NOTES: * - Small facilities less than 0.5 MGD
N/A - Not Available
K_m - BOD removal rate constant
S_o - Soluble BOD_5 in influent
S_e - Soluble BOD_5 in effluent
TSS_i - Total suspended solids in influent
TSS_e - Total suspended solids in effluent
MLSS - Mixed liquor suspended solids
MLVSS - Mixed liquor volatile suspended solids

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-2
ACTIVATED SLUDGE
TABLE OF REPORTED CAPITAL COST PER GALLON AND O&M COST PER 1,000 GALLON*

Facility Questionnaire Number	Flow (MGD)	Tank Volume (MG)	Reported Capital Cost Per Gallon ($)	(Assuming 365 Day/Yr) Total Gallon (MG)	Lb BOD Removed Per 1,000 Gallon	O&M Cost Per 1,000 Gallon ($)
500	0.720	10.8	0.101	262.8	18.28	1.30
525	1.50	1.5	2.05	547.5	0.392	1.42
908	1.40	8.4	1.48	511.0	33.27	6.29
1343	0.374	1.05	0.467	136.5	2.39	1.12
1349	0.501	0.130	4.42	182.9	5.41	1.83
1609	1.50	1.50	0.705	547.5	14.41	0.751
1695	1.84	1.05	6.25	671.6	1.44	1.18
1766	0.432	1.30	0.888	157.7	13.84	1.15
2626	0.865	7.79	0.248	315.7	2.75	0.912
2631	9.40	14.1	0.686	3431	9.16	1.90
2701	0.144	0.288	5.53	52.6	6.26	7.12
2536	3.60	4.32	0.724	1314	5.38	0.462

* 1982 Dollars

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-3
ACTIVATED SLUDGE
COMPARISON OF CAPDET AND REPORTED CAPITAL AND O&M COSTS (1982 DOLLARS)

Facility Questionnaire Number*	Flow (MGD)	Capital Costs ($)		O&M Costs ($/Yr)	
		Reported	CAPDET	Reported	CAPDET
500	0.720	1,090,900	7,775,295	342,521	555,219
525	1.50	3,080,033	2,919,627	779,093	121,058
908	1.40	12,413,398	7,711,333	3,216,222	1,419,083
1343	0.374	489,848	445,086	221,616	45,898
1349	0.501	573,986	1,050,064	335,570	141,840
1609	1.50	1,057,269	2,786,307	411,336	749,624
1695	1.84	6,564,288	1,428.127	789,781	169,902
1766	0.432	1,154,129	500,073	182,000	47,501
2626	0.865	1,935,200	6,644,254	287,817	257,274
2631	9.40	9,677,460	14,319,559	6,512,820	2,398,098
2701	0.144	1,593,000	240,266	374,694	37,346
2536	3.60	3,126,000	3,169,031	606,660	534,298
TOTAL		42,755,511	48,989,022	14,060,130	6,477,141

* Plant No. 662 deleted

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-4
ACTIVATED SLUDGE
COMPARISON OF REPORTED AND CAPDET DETENTION TIMES(T_d)

Facility Questionniare Number	Flow	T_d Reported (Day)	T_d CAPDET (Day)
500	0.720	15.0	11.79
525	1.50	1.0	1.98
908	1.40	6.0	3.79
1343	0.374	2.8	2.8
1349	0.501	0.260	0.348
1609	1.50	1.0	0.304
1695	1.84	0.057	0.158
1766	0.432	3.0	3.0
2626	0.865	9.0	9.0
2631	9.40	1.5	0.713
2701	0.144	2.0	2.0
2536	3.60	1.2	1.2

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-5
ACTIVATED SLUDGE
COMPARISON OF REPORTED AND CAPDET O&M COSTS (1982 DOLLARS)

	Reported Cost ($)	CAPDET Cost ($)	FLOW (MGD)
Plant No. 500			
Operating Labor Cost	140,636	87,273	0.720
Maintenance Labor Cost	38,807	42,710	
Power Cost	129,542	285,102	
Material Cost	33,536	138,831	
Plant No. 525			
Operating Labor Cost	298,942	38,928	1.5
Maintenance Labor Cost	224,890	16,434	
Power Cost	113,368	26,419	
Material Cost	141,893	39,281	
Plant No. 908			
Operating Labor Cost	1,457,406	158,492	1.4
Maintenance Labor Cost	698,562	91,567	
Power Cost	424,338	1,075,806	
Material Cost	635,916	93,221	
Plant No. 1343			
Operating Labor Cost	86,455	27,937	0.374
Maintenance Labor Cost	7,334	12,193	
Power Cost	96,618	1,781	
Material Cost	31,209	3,987	
Plant No. 1349			
Operating Labor Cost	216,897	47,878	0.501
Maintenance Labor Cost	56,145	20,437	
Power Cost	42,197	64,700	
Material Cost	20,330	8,832	
Plant No. 1609			
Operating Labor Cost	139,476	118,218	1.5
Maintenance Labor Cost	59,100	62,540	
Power Cost	35,460	550,108	
Material Cost	177,300	18,763	

TABLE A-5 (cont'd)
ACTIVATED SLUDGE
COMPARISON OF REPORTED AND CAPDET O&M COSTS (1982 DOLLARS)

	Reported Cost ($)	CAPDET Cost ($)	FLOW (MGD)
Plant No. 1695			
Operating Labor Cost	177,867	55,884	1.84
Maintenance Labor Cost	186,066	24,467	
Power Cost	76,721	80,222	
Material Cost	349,848	9,336	
Plant No. 1766			
Operating Labor Cost	82,740	28,536	0.432
Maintenance Labor Cost	40,188	12,683	
Power Cost	59,100	2,056	
Material Cost	------	4,225	
Plant NO. 2626			
Operating Labor Cost	137,112	50,138	0.865
Maintenance Labor Cost	14,775	21,561	
Power Cost	115,836	67,727	
Material Cost	20,094	117,853	
Plant No. 2631			
Operating Labor Cost	632,370	228,630	9.4
Maintenance Labor Cost	1,452,678	141,854	
Power Cost	3,330,876	1,950,971	
Material Cost	1,096,896	76,647	
Plant No. 2701			
Operating Labor Cost	354,600	24,282	0.144
Maintenance Labor Cost	13,002	9,394	
Power Cost	11,820	685	
Material Cost	7,092	2,985	

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-6
ACTIVATED SLUDGE
COMPARISON OF OPERATION AND MAINTENANCE MAN-HOURS

Facility Questionniare Number	Q(MGD)	Operation Man-hours		Maintenance Man-hours	
		Reported	CAPDET	Reported	CAPDET
525	1.50	16,760	1,569	9,500	792
1343	0.374	8,320	1,464	730	892
1695	1.84	11,000	2,441	10,900	1,301
1766	0.432	4,793	1,490	1,872	925
2701	0.144	10,950	1,270	400	702

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-7
ACTIVATED SLUDGE
TABLE OF REPORTED OPERATING AND MAINTENANCE LABOR RATES (1982 DOLLARS)

Facility Questionnaire Number	Flow (MGD)	Reported Labor Rates		Average ($/hr)
		Operating ($/hr)	Maintenance ($/hr)	
500	0.720	21.30	21.56	21.43
525	1.50	17.84	23.67	20.76
908	1.40	23.64	23.64	23.64
1343	0.374	10.39	10.05	10.22
1609	1.50	25.36	23.63	24.50
1695	1.84	16.17	17.07	16.62
1766	0.432	17.26	21.46	19.36
2626	0.865	15.65	24.63	20.14
2631	9.40	21.29	21.30	21.30
Total Average				$19.77

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987

TABLE A-8
BENCHMARK ANALYSIS
CAPDET COST ESTIMATES vs ACTUAL OCM PLANT REPORTED COST

PLANT	DESIGN FLOW (MGD)	TREATMENT TRAIN	COST ESTIMATES FROM CAPDET		PLANT REPORTED COSTS	
			CAPITAL COST 1990 $	ANNUAL OPERATING COST ($/YR)	CAPITAL COST 1990 $	ANNUAL OPERATING COST ($/YR)
A	0.875	Primary clarification, equalization, activated sludge, secondary clar., tetriary filtraiton. Sludge treatment: gravity thick., vacuum filtration, land filling.	7,985,600	830,550	8,064,750	461,300
B	3.75	Primary clarification, equalization, activated sludge, secondary clar., sludge treatment: belt filter, filter press, land filling.	16,092,935	1,514,020	15,595,060	2,108,000**
C	8.00	Primary clarification, equalization, activated sludge, secondary clar., sludge treatment: land filling	29,384,926	3,044,640	30,928,100*	2,727,000

* Cost includes main oil separator in addition to treatment train

** Cost represents 1991 operating budget

TABLE A-9 CAPITAL AND O&M COST ESTIMATES FOR BIOLOGICAL TREATMENT SYSTEMS		
SMALL FACILITIES FLOW ≤ 0.5 MGD		
FLOW (MGD)	**CAPITAL COST ($)**	**O&M COST ($/YEAR)**
0.001	69,100	48,900
0.005	139,000	49,850
0.1	182,700	50,100
0.05	370,400	51,450
0.1	501,300	52,300
0.5	1,111,900	72,600

TABLE A-10
BENCHMARK COMPARISON FOR
COAGULATION/FLOCCULATION/CLARIFICATION SYSTEMS

Facility No.	Flow (MGD)	Capital Costs (Built Year $)	Reported Capital Costs (1982 $)	EPA Estimated Capital Costs (1982 $)	Difference (EPA-Reported	% Difference Compared to Reported Cost**
2181	0.58	6.64×10^5 (1975)	1.15×10^6	4.68×10^5	-6.82×10^5	59% low
2474*	1.73	3.57×10^5 (1975)	6.18×10^5	7.60×10^5	1.42×10^5	23% low
2695*	2.00	6.78×10^5 (1974)	1.28×10^6	8.20×10^5	-4.60×10^5	36% low
0063	2.40	3.96×10^5 (1973)	8.44×10^5	9.00×10^5	0.56×10^5	7% high
0683	3.10	3.21×10^5 (1977)	4.76×10^5	1.05×10^6	5.74×10^5	121% high
1688	7.20	9.06×10^5 (1978)	1.25×10^6	1.80×10^6	5.50×10^5	44% high
2227	7.50	1.21×10^6 (1977)	1.80×10^6	1.83×10^6	0.03×10^6	2% high

* Only coagulation/flocculation system costs are available from Questionnaire. Reported total costs were based on coagulation/flocculation system costs plus EPA-estimated clarifier costs at corresponding flows.

** $$\% \text{ Difference} = \frac{\text{EPA-Reported}}{\text{Reported}} \times 100\%$$

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987.

TABLE A-11 CAPITAL AND O&M COST ESTIMATES FOR THE CHEMICAL PRECIPITATION TREATMENT SYSTEMS(1)		
FLOW (MGD)	**CAPITAL COST ($)**	**O&M COST ($/YEAR)**
0.2	664,000	74,200
1.0	1,114,700	155,500
5.0	2,522,100	503,500
10.0	4,234,800	938,000
20.0	8,127,100	1,754,300

(1) - Cost estimates represent 1991 Canadian dollars.

TABLE A-12
BENCHMARK COMPARISON FOR CHEMICALLY ASSISTED CLARIFICATION (CAC)

Facility Number	Treatment System	Flow (MGD)	Reported Costs (1982 $)	EPA's Estimates (1982 $)	Difference (EPA Reported) ($)	% Difference Compared to Reported Cost*
2701	Sec. Clarifier and Setl. Aids (1976)	0.14	$6.4x10^5$	$2.1x10^5$	$-4.3x10^5$	67% low
1343	Sec. Clarifier and Setl. Aids (1976)	0.37	$2.1x10^5$	$2.8x10^5$	$+7x10^4$	33% high
1349	Sec. Clarifier (1969)	0.50	$2.6x10^5$	$3.1x10^5$	$+5x10^4$	19% high
2376	Prim. Clarifier and Neutralization (1974)	0.50	$6.6x10^5$	$3.1x10^5$	$-3.5x10^5$	53% low
2110	Sec. Clarifier (1972)	0.58	$6.0x10^4$	$3.3x10^5$	$+2.7x10^5$	450% high
2181	Prim. Clarifier and Surge Tank (1975)	0.58	$8.4x10^5$	$3.3x10^5$	$-5.1x10^5$	61% low
0500	Sec. Clarifier (1978)	0.72	$2.8x10^5$	$3.5x10^5$	$+0.7x10^5$	25% high
1267	Sec. Clarifier (1974)	0.83	$8.0x10^4$	$3.8x10^5$	$+3.0x10^5$	375% high
2315	Sec. Clarifier (1958)	1.30	$6.5x10^5$	$4.7x10^5$	$-1.8x10^5$	28% low
0005	Sec. Clarifier and Setl. Aids (1960)	1.44	$4.2x10^6$	$5.0x10^5$	$-3.7x10^6$	88% low
1609	Sec. Clarifier and Polymer Add'n System (1975)	1.50	$2.3x10^5$	$5.1x10^5$	$+2.8x10^5$	122% high

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for teh Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987.

TABLE A-13 CAPITAL AND O&M COST ESTIMATES FOR CHEMICALLY ASSISTED CLARIFICATION (CAC) TREATMENT SYSTEMS[1]		
FLOW (MGD)	**CAPITAL COST ($)**	**O&M COST ($/YEAR)**
0.01	364,500	19,700
0.05	364,500	25,900
0.10	364,500	28,400
0.5	596,700	56,200
1.0	780,900	77,800
5.0	1,922,100	229,400
10.0	3,348,100	425,500
20.0	6,653,400	610,400

(1) - Cost estimates represent 1991 Canadian dollars.

TABLE A-14 FILTRATION TREATMENT SYSTEMS CAPITAL AND O&M COST ESTIMATES(1)		
FLOW (MGD)	CAPITAL COST ($)	O&M COST ($/YEAR)
0.01	393,700	32,300
0.10	485,700	45,600
1.0	994,500	77,100
2.0	1,258,900	94,900
10.0	2,541,800	161,900
20.0	5,040,100	225,600

(1) - Cost estimates represent 1991 Canadian dollars.

TABLE A-15

ADSORBABILITY GROUPS USED FOR GRANULAR ACTIVATED CARBON
COST ESTIMATES (LBS OF POLLUTANTS ADSORBED/LB CARBON)

MEDIUM ADSORBABILITY	LOW ADSORBABILITY
3,3-Dichlorobenzidine (0.165)	4-Bromophenyl Phenyl Ether (0.019)
Bis (2-Ethylhexyl) Phthalate (0.126)	Nitrobenzene (0.019)
Fluoranthene (0.110)	3,4-Benzofluoranthene (0.018)
Benzidine Dihydrochloride (0.075)	2-Chlorophenol (0.016)
Hexachlorobenzene (0.072)	Fluorene (0.015)
N-Nitrosodiphenylamine (0.070)	N-Nitrosodi-n-propylamine (0.011)
Hexachlorobutadiene (0.067)	Tetrachloroethane (0.009)
Acenaphthene (0.065)	Benzo(a)pyrene (0.008)
4,6-Dinitro-o-cresol (0.060)	Dibenzo(a,h)anthracene (0.007)
2,4-Dichlorophenol (0.060)	Toluene (0.006)
2,4-Dinitrotoluene (0.058)	Trichloroethene (0.005)
2,6-Dinitrotoluene (0.058)	Benzo(ghi)perylene (0.004)
Phenanthrene (0.058)	Bis(2-Chloroisopropyl) ether (0.004)
N-Butylphthalate (0.057)	Bromoform (0.004)
4-Chlorophenyl Phenyl Ehter (0.050)	Phenol (0.004)
2-Chloronaphthalene (0.048)	1,1,2,2-Tetrachloroethane (0.003)
Anthracene (0.044)	Carbon Tetrachloride (0.001)
Diethyl Phthalate (0.042)	Dichlorobromomethane (0.001)
Pentachlorophenol (0.041)	1,1-Dichloroethylene (0.001)
2,4-Dimethylphenol (0.040)	1,2-Dichloropropane (0.001)
1,2,4-Trichlorobenzene (0.040)	Isophorone (0.001)
2,4,6-Trichlorobenzene (0.040)	1,1,2-Trichloroethane (0.001)

TABLE A-15 (Cont'd)

ADSORBABILITY GROUPS USED FOR GRANULAR ACTIVATED CARBON COST ESTIMATES (LBS OF POLLUTANTS ADSORBED/LB CARBON)

MEDIUM ADSORBABILITY	LOW ADSORBABILITY
Naphthalene (0.039)	1,1,1-Trichloroethane (0.0009)
Acenaphthylene (0.037)	1,2-Trans-Dichloroethane (0.0007)
Butyl Benzyl Phthalate (0.036)	Acrylonitrile (0.0003)
2-Nitrophenol (0.035)	Chloroform (0.0003)
1,2-Dichlorobenzene (0.034)	1,2-Dichloroethane (0.0003)
Benzo(k)fluoranthene (0.032)	Acrolein (0.0002)
1,3-Dichlorobenzene (0.032)	1,1-Dichloroethane (0.00002)
Hexachloroethane (0.032)	Chloroethane (0.00004)
4-Nitrophenol (0.032)	Methylene Chloride (0.00004)
1,4-Dichlorobenzene (0.030)	
4,4'-Methylene-bis-(2-Chloroaniline) (0.029)	
Dimethyl Phthalate (0.029)	

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987.

TABLE A-16
GRANULAR ACTIVATED CARBON EQUIPMENT COST BASIS
(END-OF-PIPE TREATMENT)

Description*	Low Carbon Adsorption Capacity[1]					
	0.5	**1.0**	**2.0**	**5.0**	**10.0**	**20.0**
Activated Carbon Units	Four 6' dia x 28' High	Four 9' dia x 28' High	Four 12' dia x 28' High	Twelve 11' dia x 28' High	Twelve 16' dia x 28' High	Sixteen 16' dia x 40' High
Empty Bed Residence Time (min)	45	45	45	45	45	45
Carbon Bed Volume (ft^3)	2,300	4,577	9,192	22,962	45,769	91,923
Furnace Size	One 9' dia	One 11' dia	One 14' dia	One 22' dia	One 22' dia	One 22' dia

[1] - Low Carbon Adsorption Capacity = 0.005 lb/lb
* - Flow in millions of gallons per day (MGD)

SOURCE: Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987.

TABLE A-17 COST ESTIMATES FOR END-OF-PIPE CARBON TREATMENT SYSTEMS[1]					
LARGE FACILITIES FLOW ≥0.501 MGD			SMALL FACILITIES FLOW ≤0.500 MGD		
FLOW (MGD)	CAPITAL COST $	O&M COST $/YEAR	FLOW (MGD)	CAPITAL COST $	O&M COST &/YEAR
0.501	6,374,000	345,500	0.01	145,400	72,500
1.0	8,461,600	571,100	0.02	222,100	116,300
2.0	11,071,200	961,900	0.05	434,000	244,400
5.0	19,032,600	2,069,000	0.10	721,200	456,400
10.0	34,742,900	3,824,900	0.20	1,207,000	868,500
20.0	65,579,300	6,965,900			

(1) - Cost estimates represent 1991 Canadian dollars.

TABLE A-18
REPORTED STEAM STRIPPING AVERAGE INFLUENT AND EFFLUENT DATA
FROM THE 1983 SUPPLEMENTAL QUESTIONNAIRE

Plant No.	Pollutant	Influent Concentration(S_o)	Effluent Concentration (S_e)	% Removal
695	1,2-Dichloroethane	877 ppm	<1.0 ppm	99.89
	Methylene Chloride	130 ppm	<1.0 ppm	99.2
	Ethylene Dichloride	2,000 ppm	<1.0 ppm	99.95
	Bis(2-Chloroethyl)ether	400 ppm	<10.0 ppm	97.5
	Trichloroethylene	700 ppm	50.0 ppm	92.9
1446	Chlorobenzene	698 ppm	0.73 ppm	99.9
	Methylene Chloride	11,554 ppm	0.61 ppm	99.5
2701	Chlorinated Hydrocarbons	3,000 ppm	<0.5 ppm	99.85
	Chlorinated Hydrocarbons	1,000 ppm	<5.0 ppm	80.0
500	Nitrobenzene	2,400 ppm	1.0 ppm	99.96
	Benzene	100 ppm	N.D ppm	100.0
2626	Vinyl Chloride	50,000 ppm	≤10.0 ppm	99.98
2631	Ethylene Dichloride	5.7 ppm	<0.001 ppm	99.98
	2-Chloroethanol	1,222 ppm	11.0 ppm	99.1
	Trichlorethanol	3,246 ppm	151.0 ppm	95.3
1349	Vinyl Chloride	1461 ppm	16.0 ppm	98.9
908	Hydrocarbons	390 ppm	117.0 ppm	70.0
717	Vinyl Chloride	---	2.2 ppm	---
1891	Vinyl Chloride	318 ppm	5.3 ppm	98.3
1904	Benzene	---	0.06 ppm	---
	1,2-Dichloroethane	---	2.0 ppm	---
	Methylene Chloride	---	0.188 ppm	---
267	Vinyl Chloride	---	3.4 ppm	---
	Vinyl Chloride	---	5.6 ppm	---
	1,1-Dichloroethylene	---	2.5 ppm	---
	1,1-Dichloroethylene	---	1.5 ppm	---
	1,2-Dichloroethane	---	4.7 ppm	---
	1,1-Dichloroethylene	---	3.5 ppm	---
	1,1-Dichloroethylene	---	2.8 ppm	---
	Vinyl Chloride	---	2.3 ppm	---
	Vinyl Chloride	---	2.7 ppm	---
415	1,2-Dichloroethane	2,000 ppm	1.0 ppm	99.95
569	1,2-Dichloroethane	---		
	Cyanide	---		
	Phenol	---		
	Methylene Chloride	---		
	Bis(2-ethylhexyl)phthalate	---		
	Bis(2-Chloroethyl)ether	---		
669	Ethylbenzene	---		

TABLE A-18 (cont'd)
REPORTED STEAM STRIPPING AVERAGE INFLUENT AND EFFLUENT DATA
FROM THE 1983 SUPPLEMENTAL QUESTIONNAIRE

Plant No.	Pollutant	Influent Concentration(S_o)	Effluent Concentration (S_e)	% Removal
913	Vinyl Chloride	3.7 ppm		
	Chloroethane	23 ppm		
	Methylene Chloride	20 ppm		
	1,1-Dichloroethylene	---		
	1,1-Dichloroethane	6 ppm		
811	Vinyl Chloride	---		
887	Phenol	---		
1532	Vinyl Chloride	---		
	1,2-Dichloroethane	---		
2055	Ethylbenzene	---		
	Carbon Tetrachloride	---		
2272	Benzene	46 ppm	---	
	Toluene	82 ppm	---	
	Ethyl Benzene	4.2 ppm	---	
	Chloroform	0.11 ppm	---	
	Phenol	---	60.3 ppm	
4002	1,2-Dichloroethane	---	126.0 ppm	
4017	Vinyl Chloride	---	0.1 ppm	

TABLE A-19
STEAM STRIPPING PERFORMANCE DATA

Pollutant	Plant	Influent (ppb)				Effluent (ppb)				AML†	Removal Efficiency (%)
		Arithmetic Mean	Minimum	Maximum	No. Points	Arithmetic Mean	Minimum	Maximum	No. Points		
Benzene (4)	0415*	35,200	22,300	48,100	2	38.8	10	80	4	10	>99
	0415**	321,667	274,000	412,000	3	200.3	134	329	3	10	>99
	2680	92,159	34,693	147,212	10	10	10	10	10	10	>99
	1494	819,905	293	2,008,310	14	44.8	10	171	13	10	>99
Chloroethane (16)	415T	20,393	690	42,000	15	50.0	50	50	15	50	>99
	913	18,292	50	47,700	6	50.0	50	50	14	50	>99
Chloroform (23)	415T	399,263	7,330	1,088,000	15	10.5	10	16	15	10	>99
	913	118,667	28,700	200,000	6	129.2	10	290	14	10	>99
Methyl Chloride (45)	725	103,209	9,440	1,290,000	15	923.1	50	6,070	13	50	>99
1,1-Dichloroethane (13)	913	8,483	3,400	13,900	6	10.0	10	10	14	10	>99
1,2-Dichloroethane (10)	415T	9,614,773	2,339,900	23,476,000	15	56.1	10	374	15	10	>99
	913	259,500	172,000	327,000	6	73.3	10	487	14	10	>99
1,1-Dichloroethylene (29)	415T	4,358	200	10,800	15	10.2	10	13	15	10	>99
	913	5,970	2,900	12,300	6	10.0	10	10	14	10	>99
Trans-1,2-Dichloromethylene (30)	415T	13,684	4,860	43,000	15	14.1	10	57	15	10	>99
	913	36,917	14,100	70,300	6	10.0	10	10	14	10	>99
Methylene Chloride (44)	415T	2,107	198	12,100	15	10.5	10	18	15	10	>99
	913	3,398	200	10,400	6	10.0	10	10	14	10	>99
	725	1,306	10	5,100	15	217.3	10	1,120	13	10	>83
1,1,1-Trichloroethane (11)	913	18,417	11,900	35,000	6	10.0	10	10	14	10	>99
Toluene (86)	415*	3,400	2,570	4,230	2	22.3	10	47	4	10	99
	415**	22,600	19,300	29,000	3	12.0	10	16	3	10	>99
Tetrachloroethylene (85)	913	55,083	10,800	241,000	6	18.4	10	107	14	10	>99
1,1,2-Trichloroethane (14)	415T	6,811	220	14,500	8	10.0	10	10	15	10	>99
	913	18,686	416	26,400	6	11.2	10	26	14	10	>99
Trichloroethylene (87)	415	1,862	59	10,300	15	16.1	10	85	15	10	>99
	913	32,583	22,900	52,700	6	10.0	10	10	14	10	>99
Vinyl Chloride (88)	725	1,085,200	410,000	2,230,000	15	37,944.2	50	336,000	13	50	>96
	913	1,767	50	3,500	6	50.0	50	50	14	50	>97

* Steam Stripper No. 2 at Plant 415.

** Steam Stripper No. 3 at Plant 415.

† AML is the analytical minimum level.

SOURECE: Development Document Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category EPA 440/1-87/009, October 1987.

TABLE A-20

STRIPPABILITY GROUPS USED FOR STEAM STRIPPING COST ESTIMATES

HIGH (3 x 10^2 to 10^{-1})	MEDIUM (10^{-2} to 10^{-3})
Benzene	Acenaphthene
Carbon Tetrachloride	Acrylonitrile
Chlorobenzene	1,2-Dichloroethane
1,1,1-Trichloroethane	Hexachloroethane
Chloroethane	1,1,2-Trichloroethane
1,1-Dichloroethane	1,1,2,2-Tetrachloroethane
Chloroform	Methylene Chloride
Chloromethane	1,2-Dichloropropane
Toluene	1,3-Dichloropropene
Vinyl Chloride	1,1,1-Tribromomethane
1,1-Dichloroethene	Bis (2-Chloroisopropyl) Ether
1,2-Trans-dichloroethene	4-Chlorophenyl Phenyl Ether
Trichloroethene	4-Bromophenyl Phenyl Ether
Tetrachloroethene	1,2-Dichlorobenzene
Hexachloro-1,3-butadiene	1,2,4-Trichlorobenzene
Hexachlorocyclopentadiene	Hexachlorobenzene
Bromomethane	4-Nitrophenol
Dichlorobromomethane	4,6-Dinitro-o-cresol
1,3-Dichlorobenzene	Acenaphthylene
1,4-Dichlorobenzene	Benzo(k)fluoranthene
Ethylbenzene	Fluorene
	Naphthalene
	Phenanthrene
	Dimethyl Nitrosoamine
	Diphenyl Nitrosoamine

Henry's constant units are $mg/m^3/mg/m^3$

TABLE A-21

OCPSF STEAM STRIPPER DESIGN VARIABLES USED IN THE WATER GENERAL PROGRAM

Design Parameter	Units	Value
CP = Specific heat of reflux	cal/g-°K	1.0
DIFL = Liquid-phase diffusivity	ft^2/hr	9.918×10^{-5}
DIFV = Gas-phase diffusivity of pollutant into water vapor	ft^2/hr	0.311
FC = Final concentration of organic	mg/l	0.01
G = Steam rate into tower	MGD	0.10 x L (L=Liquid feed into tower)
GAMD = Activity coefficient of pollutant in organic phase	unitless	1.0
GAMS = Activity coefficient of pollutant in aqueous phase	unitless	3.775×10^{-6}
IC = Initial concentration of organic	mg/l	390
K = Vapor-liquid equilibrium constant	atm/atm	37.3
L = Liquid feed into tower	MGD	0.01 - 1.00
LPRIM = Latent heat of steam	cal/g	542.0
MU = Gas-phase viscosity	lb/ft-hr	294.3×10^{-3}
PSI = Fractional entrainment mass fraction	mole/mole	0.008
PR = Operating pressure of column	atm	1.0
REFLUX = Reflux Ratio	unitless	0.0
RHOG = Vapor density	lb_m/ft^3	0.037
RHOL = Liquid density	lb_m/ft^3	60
SAFE = Safety factor for Vm	unitless	0.75
SIGL = Liquid surface tension	dyne/cm	58.9
TB = Boiling point of aqueous reflux	°C	100
TR = Reflux temperature	°C	9
XPRF = Tray construction indicator	unitless	Perforated

TABLE A-22
COMPARISON OF PREDICTED AND REPORTED CAPITAL
AND O&M COSTS FOR STEAM STRIPPING

Plant Number	Diameter (Inches)	Height (Feet)	Reported Capital ($MM) 1982	Predicted Capital ($MM)	Reported O&M ($MM)	Predicted O&M ($MM)	Flow, Q (MGD)
296a	66	30	0.873	0.506	1.199	0.663	0.421
296b	114	55	1.442	1.554	0.352	0.469	0.0006
296d	90	45	1.172	0.924	0.652	0.430	0.069
296g	60	31	0.672	0.474	0.084	0.236	0.0031
500	60	180	1.595	1.453	0.300	0.454	0.230
908a	36	30	0.396	0.350	0.035	0.142	0.013
1446	30	16.5	0.457	0.307	0.162	0.261	0.165
2626	42	16	0.473	0.328	0.227	0.225	0.072
2701c	72	42	0.415	0.663	0.144	0.679	0.412
525a	48	65	0.436	0.547	0.367	0.253	0.075
525b	54	70.2	0.466	0.645	0.328	0.287	0.083
525c	54	70.2	0.340	0.645	0.481	0.382	0.158
662a	60	14	0.149	0.362	0.353	0.239	0.005
695a	36	22.5	0.194	0.332	0.219	0.209	0.083
695b	30	27	0.941	0.325	0.233	0.144	0.043
TOTAL			10.021	9.415	5.136	5.073	

Source: OCPSF Supplemental "308" Questionnaires

TABLE A-23 STEAM STRIPPING COST ESTIMATES		
FLOW (MGD)	**CAPITAL COST ($)**	**O&M COST ($/YEAR)[2]**
0.01	896,350	28,200
0.05	901,200	55,050
0.075	957,100	114,600
0.10	981,700	174,200
0.50	1,372,900	1,124,700
0.75	1,596,100	1,718,400
1.0	1,815,200	2,312,000

(1) - Cost estimates represent 1991 Canadian dollars.

(2) - Cost of steam was assumed to be 0.014 $(Canadian)/lb.

TABLE A-24 CAPITAL AND OPERATING COSTS ESTIMATES FOR ZERO DISCHARGE VAPOR COMPRESSION DISTILLATION AND RECYCLE		
FLOW (MGD)	CAPITAL COST ($)	OPERATING COST ($/YEAR)
0.234	10,379,860	846,600
0.342	13,421,500	1,171,400
1.04	24,750,320	2,871,200
1.9	48,658,760	5,282,200

(1) - Cost estimates represent 1991 Canadian dollars.

TABLE A-25
PROJECTED CAPITAL AND OPERATION AND MAINTENANCE (O&M) COSTS ASSOCIATED WITH ACTIVATED SLUDGE SYSTEM UPGRADES

Facility Questionnaire Number	Annual Unit Capital Cost ($Lb) (1982$)	Annual Unit O&M cost ($Lb) (1979$)	Additional BOD_5 Removal (Lbs/Day)
1977	0.056	0.039	16,760
276	0.115	0.059	7.773
2592	0.514	0.127	192
2181	0.758	0.133	321
296	0.201	0.048	3,944

TABLE A-26 SUMMARY OF DESIGN SPECIFICATIONS FOR BELT FILTER PRESS SYSTEMS					
	Flow Rates (MGD)				
Parameter	**0.5**	**1.0**	**5.0**	**10.0**	**20.0**
Sludge Production Rates (lbs/day)	834	1,668	8,340	16,680	33,360
Design Solids Loading Rates (lbs/hr)	104	208	1,040	2,080	4,160
Hydraulic Loading Rate (gpm)	10.4	20.8	104	208	416
Filter Press Size*	One 1/2 m	One 1/2 m	Two 1-1/2 m	Three 2 m	Five 2 m

* All data provided by Komline-Sanderson Engineering Corporation.

TABLE A-27
CAPITAL AND O&M COST ESTIMATES FOR
SLUDGE DEWATERING (BELT FILTER PRESS) TREATMENT SYSTEMS[1]

Flow (mgd)	Capital Cost $	O&M Cost $/year
0.5	309,100	27,100
1.0	304,100	28,200
5.0	782,700	71,400
10.0	1,297,800	105,000
20.0	2,162,800	205,500

(1) Cost estimates represent 1991 Canadian dollars

APPENDIX B

INDIVIDUAL SITE BAT OPTION REPORTS

BAT MODELS/PERFORMANCE/COST

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

AKZO CHEMICALS LTD.

1.0 PLANT DESCRIPTION

Akzo Chemicals Ltd. is located south of Sarnia, in the "Chemical Valley", approximately 1 km from the St. Clair River. The plant is adjacent to Polysar, another organic chemical manufacturing company. The facility was originally constructed by Polysar in 1961 to produce Acrylonitrile, Butadiene and Styrene (ABS) resins. After four years of operation, the plant was shut down due to lack of profitability. In 1972, the production of ABS resins was restarted. In 1984, ARMAK leased the site from BASF and Bayer. In 1988, the ARMAK name was changed to AKZO. AKZO is a division of AKZO NV in the Netherlands.

Akzo produces the following finished products:

- quaternary ammonium salts - primarily used as a fabric softener
- tallow imidazoline - also used as a fabric softener
- amides - used as defoamers in the pulp and paper industry and as lubricants/slip agents in the plastics industry.

Akzo receives its process and cooling water from Polysar. Process water is softened. City water is used as potable water and fire water is available from Polysar via BASF (an adjacent organic chemical plant).

The wastewater produced by the plant is collected, metered, and pumped for treatment to the adjacent Polysar Wastewater Treatment Plant. Spent, non-contact cooling water and non-contact steam condensate is discharged via the Cole Drain to the St. Clair River via MISA Control Point OT 0100.

Details on the plant processes, water uses and wastewater management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Wastewater generated at the plant is collected in four different sewers:

- a cooling water and condensate sewer that discharges to the St. Clair River through MISA Control Point OT 0100 and the Cole Drain.
- a process sewer that collects process and washdown wastewater, and roof drains. It discharges to a settling tank from which the wastewater is pumped for treatment to Polysar.
- a storm sewer that collects stormwater from the plant site and discharges to the Cole Drain through the Outfall ST 0300.
- a sanitary sewer that discharges to Sarnia sanitary sewer.

During the MISA Twelve Month Monitoring Period, only the Reactor #4 cooling water (MISA Control Point OT 0100) was monitored.

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

The following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and supplied by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed that the plant's effluent (OT 0100) was not acutely lethal to both Rainbow Trout and Daphnia Magna. As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best technologies from similar U.S. and Ontario plants which, if installed, will achieve the maximum overall pollutant reduction. The analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0100 indicate that the plant's current pollutant discharge levels are as low or lower than discharge levels from similar organic chemical manufacturing plants in the U.S. and Ontario. Therefore, no additional treatment is recommended for BAT Option 2.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward zero discharge/virtual elimination. Technologies considered under this option include any current technology or combination of current technologies, including supplemental or cross-over technologies from other industrial sectors. The quality of the plant's effluent, as indicated by the analytical results from the MISA monitoring, cannot be significantly improved with any other current technology or a combination of current technologies employed by the OCM sector plants or any other industrial sector.

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Since no additional treatment was recommended for any BAT option, there is no reduction to the current pollutant loadings. The current pollutant loadings for MISA Control Point OT 0100 as obtained from the MISA OCM Sector Twelve Month Report are presented in Appendix B of this report.

5.0 BAT OPTIONS COST ESTIMATES

Since no additional treatment was recommended under any BAT Option, no cost estimates were developed.

6.0 REFERENCES

1. Akzo Chemicals Ltd. BAT Status of OCM Sector Plants, Site Visit Information Report, MISA Industrial Section, Water Resources Branch, Ministry of the Environment, April 10, 1991.

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR AKZO CHEMICALS LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – AKZO CHEMICALS LTD. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0600	OT 0100
1	COD	10	mg/L	–	–
2	Cyanide Total	0.005	mg/L	–	–
3	Hydrogen ion (pH)			–	7.4
4	Ammonia plus Ammonium	0.25	mg/L	–	0.10
4	Nitrate+Nitrite	0.25	mg/L	–	0.27
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	0.2
5	DOC	0.5	mg/L	–	2.2
5	TOC	5	mg/L	–	2
6	Total phosphorus	0.10	mg/L	–	0.10
7	Specific conductance	5	uS/cm	–	432
8	Total suspended solids	5	mg/L	–	6
8	Volatile suspended solids	10	mg/L	–	–
9	Aluminum	30.0	ug/L	–	36.7
9	Zinc	10.0	ug/L	–	14.2
14	Phenolics (4AAP)	2.0	ug/L	–	2.1
25	Oil and grease	1.0	mg/L	–	1.0
98	Ftflow		m3/day	–	2040

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0600 – Intake Water to Site
OT 0100 – Reactor #4 Cooling Water to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – AKZO CHEMICALS LTD. – SARNIA

ATG	PARAMETER	IN 0600	OT 0100	TOTAL
1	COD	–	–	–
2	Cyanide Total	–	–	–
4	Ammonia plus Ammonium	–	0.201	0.201
4	Nitrate+Nitrite	–	0.534	0.534
4	Total Kjeldahl Nitrogen	–	0.349	0.349
5	DOC	–	4.116	4.116
5	TOC	–	4.635	4.635
6	Total phosphorus	–	0.204	0.204
8	Total suspended solids	–	10.911	10.911
8	Volatile suspended solids	–	–	–
9	Aluminum	–	0.077	0.077
9	Zinc	–	0.032	0.032
14	Phenolics (4AAP)	–	0.004	0.004
25	Oil and grease	–	2.040	2.040

EXPLANATORY NOTES:
(i) '–' not required by regulation or no conc/flow data available

SAMPLING POINTS:
IN 0600 – Intake Water to Site
OT 0100 – Reactor #4 Cooling Water to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
AKZO CHEMICALS LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - AKZO CHEMICALS LTD. - SARNIA

CONTROL POINT - OT 0100 Reactor #4 Cooling Water to River
AVERAGE FLOWRATE = 2040 M3/DAY

						BAT OPTION 1		BAT OPTION 2		BAT OPTION 3				
				12 MONTH AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	0.10	0.201	0.10	0 201	0.10	0 201	0.10	0.201	Akzo	Akzo	Akzo
4	Nitrate+Nitrite	0.25	mg/L	0.27	0.534	0.27	0.534	0.27	0 534	0.27	0.534	Akzo	Akzo	Akzo
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	0.349	0.2	0.349	0.2	0.349	0.2	0.349	Akzo	Akzo	Akzo
5	DOC	0.5	mg/L	2.2	4.116	2.2	4.116	2.2	4 116	2.2	4.116	Akzo	Akzo	Akzo
5	TOC	5	mg/L	2	4.635	2	4.635	2	4.635	2	4.635	Akzo	Akzo	Akzo
6	Total phosphorus	0.10	mg/L	0.10	0.204	0.10	0.204	0.10	0.204	0.10	0.204	Akzo	Akzo	Akzo
8	Total suspended solids	5	mg/L	6	10.911	6	10.911	6	10.911	6	10.911	Akzo	Akzo	Akzo
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-	-	-	-
9	Aluminum	30.0	ug/L	36.7	0.077	36.7	0.077	36.7	0.077	36.7	0.077	Akzo	Akzo	Akzo
9	Zinc	10.0	ug/L	14.2	0.032	14 2	0.032	14.2	0.032	14.2	0.032	Akzo	Akzo	Akzo
14	Phenolics (4AAP)	2.0	ug/L	2.1	0.004	2.1	0.004	2.1	0.004	2.1	0.004	Akzo	Akzo	Akzo
25	Oil and grease	1.0	mg/L	1.0	2.040	1.0	2.040	1.0	2.040	1.0	2.040	Akzo	Akzo	Akzo

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chémicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

AMOCO CANADA PETROLEUM COMPANY LTD.

1.0 PLANT DESCRIPTION

The Amoco Sarnia plant is located in an industrial area southeast of the city. It was built in phases, starting in 1970, when the first butane splitter, debutanizer, and depropanizer units were constructed. By 1984, all currently operating units had been installed.

The plant separates and refines supplies of liquefiable hydrocarbons obtained from natural gas sources. The crude, liquified feedstock mix and refined, liquified products are stored on site in underground cavities, so seasonal demand can be met. Some isomerization of butanes is also carried out on-site. Higher molecular weight by-product material is routed, untreated, to a local oil refinery. The main products are as follows:

- propane - used as heating fuel, auto fuel, and petrochemical feedstock
- isobutane, normal butane, and condensate - used as gasoline and petrochemical feedstock

Feedstock and products are shipped to and from the plant by truck, rail, and pipeline. Most of the feedstock originates in Western Canada and is shipped to the plant through a pipeline. Large quantities of feedstock and products are stored on the plant site in salt caverns approximately 800 meters underground.

Wastewater generated at the site flows into an API separator before being discharged to the Cole Drain (MISA Control Point CO 0100) which in turn discharges into the St. Clair River.

The existing wastewater treatment system at the plant has been primarily designed to remove oil and grease and suspended solids from the plant's combined process and storm water. It consists of a surge pond with an inlet distributor, a surge pond sump equipped with a pump, an API separator, and an oil holding tank.

Details on the plant processes, water uses and wastewater management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

MISA Control Point CO 0100, a combined process and stormwater sewer, collects equipment washdown water, cooling tower blowdown and stormwater runoff from the processing area. This stream discharges into the Cole Drain (a local water course) which in turn discharges to the St. Clair River.

Stormwater from the west side of the property is collected in a separate storm drain which discharges directly to the Cole Drain. Sanitary water is collected in a sanitary sewer and discharged to the City sewer.

Table 1.0 presents a summary of wastewater generated at the plant.

TABLE 1.0
WASTEWATER SOURCES

SOURCE	DESTINATION
· Cooling tower blowdown · Equipment washwater · Stormwater from process area	API Separator, CO 0100/Cole Drain
· Sanitary wastewater	City Sewer
· Stormwater from west side of plant	Directly to Cole Drain

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Monitoring Report for MISA Control Point CO 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

The following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled, and supplied by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed that the plant's combined final effluent (MISA Control Point CO 0100) was not acutely lethal to both Rainbow Trout and Daphnia Magna. As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants which, if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA Twelve Month Monitoring Period showed elevated concentrations of some conventional and volatile organic pollutants and some metals for the API separator effluent (MISA Control Point CO 0100).

Contaminants detected in the API separator at elevated concentrations include, COD (91 mg/l), DOC (20.7 mg/l), TOC (27 mg/l), aluminum (414.9 ug/l), molybdenum (495.9 ug/l), 1,2-dichlorobenzene (60.5 ug/l) and benzene (40.2 ug/l). Based on these analytical results, multimedia filtration and granular activated carbon are recommended for the control of all contaminants except molybdenum.

A pollution prevention approach, a Best Management Practices (BMP's) study, is also recommended to identify the sources and implementation of method(s) of control for molybdenum. One approach to BMPs is provided in a draft report prepared by Environment Canada which provides guidelines for development and implementation of BMP plans (Ref. 2).

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward zero discharge/virtual elimination of contaminants. A search which included any current technology or combination of current technologies including supplemental/add-on technologies or cross-over technologies from other industrial sectors was carried out as part of this study. Based on the contaminants present in the effluents after implementation of BAT Option 2 and the results of this search, no significant improvement in effluent quality can be expected with the addition of any current technology or combination of current technologies employed by OCM Sector plants or any other industrial sector.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT options recommended for Amoco Canada Ltd. for MISA Control Point CO 0100.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR AMOCO CANADA LTD.
MISA CONTROL POINT CO 0100

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-lethal effluent	· No additional treatment
2	USA/Ontario/Maximum Removal Pollutant	· Multi-media filtration · Granular Activated Carbon · BMP's for molybdenum
3	Zero Discharge/Virtual Elimination	· Same as Option 2

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost

estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and cannot be easily estimated on an industry- wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation, was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Amoco Canada Ltd. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 3).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Options for Amoco Canada Petroleum Company Ltd. The only cost estimates are for granular activated carbon and multimedia filtration at MISA Control Point CO 0100. Cost estimates for development and implementation of a BMP Plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
AMOCO CANADA PETROLEUM COMPANY LTD.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
CO 0100	548	0	0	NAT	NA	NA	BMP's	2,239,600	891,700	Same as Option 2
					1,134,000	805,200	GAC			
					1,105,600	86,500	FIL			
					2,239,600	891,700	TOTAL			

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
FIL - Multimedia Filtration
NA - Not available

6.0 REFERENCES

1. Amoco Canada Petroleum Company Ltd. - BAT Status of OCM Sector Plants Site Visit Information Report, April 15, 1991.

2. J.S. Shrives, Oil, Gas & Energy Division, Industrial Program Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMP's) and Their Application to Ontario's MISA Program", May 1987.

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR AMOCO CANADA PETROLEUM COMPANY LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – AMOCO CANADA RESOURCES LTD. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0800	CO 0100
1	COD	10	mg/L	–	91
2	Cyanide Total	0.005	mg/L	–	0.006
3	Hydrogen ion (pH)			–	7.8
4	Ammonia plus Ammonium	0.25	mg/L	–	0.08
4	Nitrate+Nitrite	0.25	mg/L	–	0.07
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	1.7
5	DOC	0.5	mg/L	–	20.7
5	TOC	5	mg/L	–	27
6	Total phosphorus	0.10	mg/L	–	0.86
7	Specific conductance	5	uS/cm	–	1335
8	Total suspended solids	5	mg/L	–	23
8	Volatile suspended solids	10	mg/L	–	–
9	Aluminum	30.0	ug/L	–	414.9
9	Boron	50.0	ug/L	–	57.7
9	Copper	10.0	ug/L	–	46.6
9	Molybdenum	20.0	ug/L	–	495.9
9	Zinc	10.0	ug/L	–	46.0
10	Arsenic	5.0	ug/L	–	9.8
12	Mercury	0.10	ug/L	–	0.49
14	Phenolics (4AAP)	2.0	ug/L	–	8.8
15	Sulphide	20.0	ug/L	–	64.5
16	1,1–Dichloroethane	0.8	ug/L	–	2.0
16	1,2–Dichlorobenzene	1.4	ug/L	–	60.5
16	1,4–Dichlorobenzene	1.7	ug/L	–	3.5
16	Bromodichloromethane	0.8	ug/L	–	0.6
16	Carbon tetrachloride	1.3	ug/L	–	7.7
16	Chlorobenzene	0.7	ug/L	–	9.7
16	Chloroform	0.7	ug/L	–	5.2
17	Benzene	0.5	ug/L	–	40.2
17	Toluene	0.5	ug/L	–	16.9
17	m–Xylene and p–Xylene	1.1	ug/L	–	15.4
17	o–Xylene	0.5	ug/L	–	8.0
23	1,2,3–Trichlorobenzene	10.0	ng/L	–	44.7
25	Oil and grease	1.0	mg/L	–	4.1
98	Ftflow		m3/day	–	377

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0800 – Intake Water to Site
CO 0100 – API Separator Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91.

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – AMOCO CANADA RESOURCES LTD. – SARNIA

ATG	PARAMETER	IN 0800	CO 0100	TOTAL
1	COD	–	52.109	52.109
2	Cyanide Total	–	0.002	0.002
4	Ammonia plus Ammonium	–	0.061	0.061
4	Nitrate+Nitrite	–	0.017	0.017
4	Total Kjeldahl Nitrogen	–	0.708	0.708
5	DOC	–	7.308	7.308
5	TOC	–	11.684	11.684
6	Total phosphorus	–	0.292	0.292
8	Total suspended solids	–	12.308	12.308
8	Volatile suspended solids	–	–	–
9	Aluminum	–	0.246	0.246
9	Boron	–	0.023	0.023
9	Copper	–	0.021	0.021
9	Molybdenum	–	0.166	0.166
9	Zinc	–	0.020	0.020
10	Arsenic	–	0.004	0.004
12	Mercury	–	*	*
14	Phenolics (4AAP)	–	0.003	0.003
15	Sulphide	–	0.019	0.019
16	1,1–Dichloroethane	–	*	*
16	1,2–Dichlorobenzene	–	0.025	0.025
16	1,4–Dichlorobenzene	–	0.002	0.002
16	Bromodichloromethane	–	*	*
16	Carbon tetrachloride	–	0.002	0.002
16	Chlorobenzene	–	0.003	0.003
16	Chloroform	–	0.002	0.002
17	Benzene	–	0.011	0.011
17	Toluene	–	0.005	0.005
17	m–Xylene and p–Xylene	–	0.004	0.004
17	o–Xylene	–	0.002	0.002
23	1,2,3–Trichlorobenzene	–	*	*
25	Oil and grease	–	1.758	1.758

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS
IN 0800 – Intake Water to Site
CO 0100 – API Separator Effluent to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS FOR AMOCO CANADA PETROLEUM COMPANY LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - AMOCO CANADA RESOURCES LTD. - SARNIA

CONTROL POINT - CO 0100 API Separator Effluent to River
AVERAGE FLOWRATE = 377 m3/day

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	91	52.109	91	52 109	31	11.687	31	11.687	Amoco	Esso	Esso
2	Cyanide Total	0.005	mg/L	0.006	0.002	0 006	0 002	0 006	0 002	0 006	0.002	Amoco	Amoco	Amoco
4	Ammonia plus Ammonium	0.25	mg/L	0.08	0.061	0.08	0.061	0.08	0.061	0.08	0.061	Amoco	Amoco	Amoco
4	Nitrate+Nitrite	0.25	mg/L	0.07	0.017	0.07	0.017	0.07	0.017	0.07	0.017	Amoco	Amoco	Amoco
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.7	0.708	1.7	0.708	1.7	0.708	1.7	0.708	Amoco	Amoco	Amoco
5	DOC	0.5	mg/L	20.7	7.308	20.7	7.308	4.4	1.659	4.4	1.659	Amoco	Esso	Esso
5	TOC	5	mg/L	27	11.684	27	11 684	27	11.684	27	11.684	Amoco	Amoco	Amoco
6	Total phosphorus	0.10	mg/L	0.86	0.292	0.86	0.292	0.86	0.292	0 86	0.292	Amoco	Amoco	Amoco
8	Total suspended solids	5	mg/L	23	12.308	23	12.308	5	1.885	5	1.885	Amoco	Amoco	P1774
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	414 9	0.246	414.9	0.246	47.0	0.018	47.0	0.018	Amoco	RREL	RREL
9	Boron	50.0	ug/L	57.7	0.023	57.7	0.023	57.7	0.023	57.7	0.023	Amoco	Amoco	Amoco
9	Copper	10 0	ug/L	46.6	0.021	46 6	0.021	46.6	0.021	46.6	0.021	Amoco	Amoco	Amoco
9	Molybdenum	20 0	ug/L	495.9	0.166	495 9	0.166	495.9	0.166	495.9	0.166	Amoco	BMPs	BMPs
9	Zinc	10.0	ug/L	46.0	0.020	46 0	0.020	42.0	0.016	42.0	0.016	Amoco	Amoco	RREL
10	Arsenic	5.0	ug/L	9.8	0.004	9.8	0.004	9.8	0.004	9 8	0.004	Amoco	Amoco	Amoco
12	Mercury	0.10	ug/L	0.49	*	0.49	*	0.49	*	0.49	*	Amoco	Amoco	Amoco
14	Phenolics (4AAP)	2.0	ug/L	8 8	0.003	8.8	0 003	2.5	0.001	2.5	0.001	Amoco	Esso	Esso
15	Sulphide	20.0	ug/L	64.5	0.019	64.5	0.019	64.5	0.019	64 5	0.019	Amoco	Amoco	Amoco
16	1,1-Dichloroethane	0.8	ug/L	2.0	*	2 0	*	2.0	*	2.0	*	Amoco	Amoco	Amoco
16	1,2-Dichlorobenzene	1.4	ug/L	60.5	0.025	60.5	0.025	60.5	0.025	60.5	0.025	Amoco	Amoco**	Amoco**
16	1,4-Dichlorobenzene	1.7	ug/L	3.5	0.002	3.5	0.002	3.5	0.002	3.5	0.002	Amoco	Amoco	Amoco
16	Bromodichloromethane	0.8	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Amoco	Amoco	Amoco
16	Carbon tetrachloride	1.3	ug/L	7.7	0.002	7.7	0.002	7.7	0.002	7.7	0.002	Amoco	Esso	Esso
16	Chlorobenzene	0.7	ug/L	9 7	0.003	9.7	0.003	9.7	0.003	9.7	0.003	Amoco	Amoco	Amoco
16	Chloroform	0.7	ug/L	5.2	0.002	5 2	0.002	1.2	*	1.2	*	Amoco	Esso	Esso
17	Benzene	0.5	ug/L	40.2	0.011	40.2	0.011	3.4	0.001	3.4	0.001	Amoco	Esso	Esso
17	Toluene	0.5	ug/L	16.9	0.005	16.9	0.005	5.4	0.002	5 4	0.002	Amoco	Esso	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	15.4	0.004	15 4	0.004	5.0	0.002	5.0	0.002	Amoco	Esso	Esso
17	o-Xylene	0.5	ug/L	8.0	0.002	8.0	0.002	2.6	0.001	2.6	0.001	Amoco	Esso	Esso
23	1,2,3-Trichlorobenzene	10.0	ng/L	44.7	*	44 7	*	44.7	*	44.7	*	Amoco	Amoco	Amoco
25	Oil and grease	1.0	mg/L	4.1	1.758	4 1	1 758	4.1	1 758	4.1	1.758	Amoco	Amoco	Amoco

* - Less than 1 gram per day

** - No performance data available but reductions can be expected based on the addition of granular activated carbon recommended in Options 2 and 3.

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFArn	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

B.F. GOODRICH (CANADA) INC.

1.0 PLANT DESCRIPTION

The B.F. Goodrich (Canada) Niagara Plant is located on the southwestern edge of the City of Niagara Falls, Ontario. The facility manufactures polyvinyl chloride (PVC) resin utilizing the suspension polymerization process. The site occupies about 49 hectares adjoining the Welland River.

Initial production at the site started in 1957 in a dispersion resin process unit referred to as Geon South. This original unit was mothballed in April of 1990. Currently, there are no plans for restarting this unit.

The facility added a compounding plant in 1988 with a small expansion of this operation in 1990. In general, there is no water used in the compounding operation where additives and pigments are blended with the PVC resin to customer specifications.

At the present time, the plant is comprised of:

- two suspension polymerization units
- the mothballed dispersion resin unit
- receiving and storage for raw materials
- compounding plant
- water preparation plant
- steam production powerhouse
- biological treatment plant

Details on the plant processes, water uses and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

The treated process wastewater is joined by other discharge streams such as boiler blowdown, demineralized regeneration water and stormwater runoff to make up a single direct discharge (MISA

Control Point PR 0100). Sanitary wastes are treated in a septic system which is then fed to the wastewater treatment plant.

Table 1.0 summarizes the sources of wastewater for the MISA Control Point PR 0100.

Table 1.0
Process Related Wastewater at B.F. Goodrich, Niagara Falls

Source	Type	Destination
Resin Manufacturing Line		
Geon North	Process	VCM Recovery/Wastewater Treatment Facility (PR 0100)
	Cooling Tower Blowdown	Wastewater Treatment Facility (PR 0100)
Geon West	Process	VCM Recovery/Wastewater Treatment Facility (PR 0100)
	Cooling Tower Blowdown	Wastewater Treatment Facility (PR 0100)
Geon South	Drying	Wastewater Treatment Facility (PR 0100)
Compounding		
Compounding	Housekeeping	Wastewater Treatment Facility (PR 0100)
Other Sources		
Sanitary		Wastewater Treatment Facility (PR 0100)
Boiler	Boiler Blowdown	To Welland River (PR 0100)
Demineralizer Regeneration		To Welland River (PR 0100)
Stormwater Runoff	From Non-Process Areas	To Welland River (PR 0100)

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results for MISA Control Points PR 0100 and IN 0600 as obtained from the MISA OCM Sector Twelve Month Report. Based on conversions with B.F. Goodrich personnel, it was decided to use the average of the last 3 months of the MISA Twelve Month Monitoring Period to represent the B.F. Goodrich (Canada) Niagara Plant's current effluent concentrations and loadings for vinyl chloride when selecting technologies and estimating compliance costs for each BAT Option.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

- Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.
- Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.
- Option 3 - a BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and supplied by the plant to the Ministry of the Environment for the Twelve Month Monitoring Period showed that the plant's only direct effluent discharge (MISA Control Point PR 0100) was not acutely lethal. As a result of these findings, no additional treatment is recommended under this BAT option.

3.2 BAT OPTION 2

This BAT option incorporates the best available technologies from similar U.S. and Ontario plants which, if installed, will achieve the maximum overall pollutant reduction. The analytical results obtained from the MISA OCM Sector Twelve Month Report from MISA Control Point PR 0100 showed some high levels of vinyl chloride. It is evident that the high vinyl chloride effluent concentrations are attributed to plant operations, since Vinyl Chloride Monomer (VCM) is used as a raw material in the production of PVC.

However, the plant has been able to reduce the effluent concentrations of vinyl chloride at PR 0100 after upgrading their steam stripper in the resin manufacturing process system. Analytical results collected during the last three months of MISA monitoring (07/90, 08/90 and 09/90) and after the stripper upgrades

took place, showed that the vinyl chloride effluent concentrations had been dropped dramatically. Effluent vinyl chloride concentrations averaged 18.4 ug/l, 1.664 ug/l and 0.90 ug/l during the months of July, August and September, respectively. It is evident that with the steam stripper upgrades, the plant was able to achieve BAT effluent levels of vinyl chloride; therefore, the installation of additional stripping capacity for vinyl chloride removal was not recommended under BAT Option 2.

3.3 BAT OPTION 3

This option incorporates those technologies that would move the plant furthest toward zero discharge/virtual elimination of pollutants. Technologies considered under this option include any current technology or combination of current technologies, including supplemental or cross-over technologies from other industrial sectors. During the MISA Twelve Month Monitoring Period, relatively elevated concentrations of DOC (11.9 mg/L), TOC (16 mg/L), total suspended solids (25 mg/L), aluminum (535.9 ug/L) and octachlorodibenzo-p-dioxin (227.5 pq/L) were detected in the final effluent to the River (PR 0100). Although aluminum and octachlorodibenzo-p-dioxin were detected at similar concentrations in the intake water, the multi-media filtration/granular activated carbon system recommended for removal of DOC, TOC and total suspended solids will also remove these contaminants as well.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for B.F. Goodrich.

Table 2.0
Summary of BAT Options for B.F. Goodrich
MISA Control Point PR 0100

BAT Option	Definition	Description
1	Non-lethal Effluent	No additional treatment
2	USA/Ontario BAT/Maximum Reduction Pollutant	No additional treatment
3	Zero Discharge/Virtual Elimination	Multimedia filtration Granular Activated Carbon

4.0 PERFORMANCE DATA OF SELECTED BAT OPTIONS

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. However, please note that the current loadings for vinyl chloride have been adjusted to reflect the reduction achieved since the steam stripper upgrades were completed. The final three months of the MISA Twelve Month Monitoring Period were chosen as representative of the current loadings for the B.F. Goodrich (Canada) Niagara Plant. Finally, it is noted that BAT steam stripper performance for vinyl chloride can achieve an effluent quality of not detected (Detection Limit = 50 ppb) as documented in the OCPSF Public Record for Plant No. 725.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and cannot be easily estimated on an industry-wide basis. The average flow rate, as obtained from the OCM Sector Twelve Month Report plus one standard deviation, was used as the design flow to estimate compliance costs from previously developed cost curves. It should be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for B.F. Goodrich (Canada) Inc. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987)(Ref. 2).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Options for B.F. Goodrich (Canada) Inc. The only cost estimates are for granular activated carbon and multimedia filtration at MISA Control Point PR 0100.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
B.F. GOODRICH (CANADA) INC.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
PR 0100	3,618	0	0	NAT	0	0	NAT	928,900	76,300	FIL
								7,973,500	553,900	GAC
								8,902,400	630,200	TOTAL

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
FIL - Multimedia Filtration
NA - Not available

6.0 REFERENCES

1. B.F. Goodrich BAT Status of OCM Sector Plants, Site Visit Information Report, MISA WRB MOE, April 23, 1991.

2. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category, (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR
B.F. GOODRICH CANADA INC.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – B.F. GOODRICH CANADA INC. – THOROLD

ATG	PARAMETER	RMDL	UNIT	IN 0600	PR 0100
1	COD	10	mg/L	29	25
2	Cyanide Total	0.005	mg/L	0.005	0.097
3	Hydrogen ion (pH)			7.8	7.8
4	Ammonia plus Ammonium	0.25	mg/L	0.15	0.29
4	Nitrate+Nitrite	0.25	mg/L	1.08	0.93
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.7	1.3
5	DOC	0.5	mg/L	6.8	11.9
5	TOC	5	mg/L	7	16
6	Total phosphorus	0.10	mg/L	0.08	0.13
7	Specific conductance	5	uS/cm	329	1096
8	Total suspended solids	5	mg/L	24	25
8	Volatile suspended solids	10	mg/L	6	12
9	Aluminum	30.0	ug/L	389.8	535.9
9	Boron	50.0	ug/L	47.4	65.3
9	Molybdenum	20.0	ug/L	13.8	28.4
9	Zinc	10.0	ug/L	16.8	37.5
11	Chromium (hexavalent)	10.0	ug/L	8.8	11.5
14	Phenolics (4AAP)	2.0	ug/L	5.3	7.7
15	Sulphide	20.0	ug/L	27.7	34.3
16	Chloroform	0.7	ug/L	0.7	8.8
16	Methylene chloride	1.3	ug/L	2.6	2.3
16	Trichloroethylene	1.9	ug/L	0.4	4.8
16	Vinyl chloride	4.0	ug/L	0.9	159.0
17	Toluene	0.5	ug/L	0.9	0.8
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	162.5	227.5
25	Oil and grease	1.0	mg/L	1.4	1.2
98	Ftflow		m3/day	–	2580

Explanatory Notes:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0600 – Intake Water to Site
PR 0100 – Final Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – B.F. GOODRICH CANADA INC. – THOROLD

ATG	PARAMETER	IN 0600	PR 0100	TOTAL
1	COD	60.478	52.453	52.453
2	Cyanide Total	0.014	0.250	0.250
3	Ammonia plus Ammonium	0.419	0.746	0.746
4	Nitrate+Nitrite	3.126	2.678	2.678
4	Total Kjeldahl Nitrogen	1.975	3.531	3.531
5	DOC	18.707	33.626	33.626
5	TOC	20.878	46.720	46.720
6	Total phosphorus	0.227	0.329	0.329
8	Total suspended solids	67.257	67.210	67.210
8	Volatile suspended solids	15.581	30.492	30.492
9	Aluminum	1.151	1.472	1.472
9	Boron	0.137	0.184	0.184
9	Molybdenum	0.038	0.090	0.090
9	Zinc	0.050	0.097	0.097
11	Chromium (hexavalent)	0.024	0.034	0.034
14	Phenolics (4AAP)	0.016	0.021	0.021
15	Sulphide	0.077	0.093	0.093
16	Chloroform	0.002	0.024	0.024
16	Methylene chloride	0.007	0.007	0.007
16	Trichloroethylene	0.001	0.013	0.013
16	Vinyl chloride	0.003	0.490	0.490
17	Toluene	0.002	0.002	0.002
24	Octachlorodibenzo–p–dioxin	*	*	*
25	Oil and grease	3.281	2.992	2.992

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0600 – Intake water to site
PR 0100 – Final Effluent to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
B.F. GOODRICH CANADA INC.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - B.F. GOODRICH CANADA INC. - THOROLD

CONTROL POINT - PR 0100 Final Effluent to River
AVERAGE FLOWRATE = 2580 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV .RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	25	52.453	25	52.453	25	52.453	25	52.453	B.F. G	B.F. G	B.F. G
2	Cyanide Total	0.005	mg/L	0.097	0.250	0.097	0.250	0.097	0 250	0.097	0.250	B.F. G	B.F. G	B.F. G
4	Ammonia plus Ammonium	0.25	mg/L	0.29	0.746	0.29	0.746	0.29	0.746	0.29	0.746	B.F. G	B.F. G	B.F. G
4	Nitrate+Nitrite	0.25	mg/L	0.93	2.678	0.93	2.678	0.93	2.678	0.93	2.678	B.F. G	B.F. G	B.F. G
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.3	3.531	1.3	3.531	1.3	3 531	1.3	3.531	B.F. G	B.F. G	B.F. G
5	DOC	0.5	mg/L	11.9	33.626	11 9	33.626	11.9	33 626	4.4	11.352	B.F. G	B.F. G	Esso
5	TOC	5	mg/L	16	46.720	16	46.720	16	46.720	5	12.900	B.F. G	B.F. G	Esso
6	Total phosphorus	0.10	mg/L	0.13	0.329	0.13	0.329	0.13	0.329	0.13	0.329	B.F. G	B.F. G	B.F. G
8	Total suspended solids	5	mg/L	25	67.210	25	67.210	25	67.210	5	12.900	B.F. G	B.F. G	P1774
8	Volatile suspended solids	10	mg/L	12	30.492	12	30.492	12	30.492	5	12.900	B.F. G	B.F. G	P1774
9	Aluminum	30.0	ug/L	535.9	1.472	535.9	1.472	535.9	1.472	47.0	0.121	B.F. G	B.F. G	RREL
9	Boron	50 0	ug/L	65.3	0.184	65 3	0.184	65.3	0.184	65.3	0.184	B.F. G	B.F. G	B.F. G
9	Molybdenum	20.0	ug/L	28.4	0.090	28.4	0.090	28.4	0.090	28.4	0.090	B.F. G	B.F. G	B.F. G
9	Zinc	10.0	ug/L	37.5	0.097	37.5	0.097	37.5	0.097	37.5	0.097	B.F. G	B.F. G	B.F. G
11	Chromium (hexavalent)	10.0	ug/L	11.5	0.034	11.5	0.034	11.5	0.034	11.5	0.034	B.F. G	B.F. G	B.F. G
14	Phenolics (4AAP)	2.0	ug/L	7.7	0.021	7.7	0.021	7.7	0.021	2.5	0.006	B.F. G	B.F. G	Esso
15	Sulphide	20.0	ug/L	34.3	0.093	34 3	0.093	34.3	0.093	34.3	0.093	B.F. G	B.F. G	B.F. G
16	Chloroform	0.7	ug/L	8.8	0.024	8 8	0.024	8.8	0.024	1.2	0.003	B.F. G	B.F. G	Esso
16	Methylene chloride	1.3	ug/L	2.3	0.007	2.3	0.007	2.3	0.007	2.3	0.007	B.F. G	B.F. G	B.F. G
16	Trichloroethylene	1.9	ug/L	4.8	0.013	4.8	0.013	4.8	0.013	4.8	0.013	B.F. G	B.F. G	B.F. G
16	Vinyl chloride	4.0	ug/L	7.3**	0.019	7.3**	0.019	7.3**	0.019	2.6	0.007	B.F. G	B.F. G	Esso
17	Toluene	0.5	ug/L	0.8	0.002	0.8	0.002	0.8	0.002	0.8	0.002	B.F. G	B.F. G	B.F. G
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	227.5	*	227.5	*	227.5	*	35.0	*	B.F. G	B.F. G	Esso
25	Oil and grease	1.0	mg/L	1.2	2.992	1.2	2.992	1.2	2.992	1.2	2.992	B.F. G	B.F. G	B.F. G

* - Less than 1 gram per day
** - Average over last 3 months

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	- Akzo Chemicals Ltd. Sarnia
Amoco	- Amoco Canada Resources Ltd. Sarnia
BASFAm	- BASF Fibres Arnprior
BASFS	- BASF Canada Inc. Sarnia
B.F.G	- B.F. Goodrich Canada Inc. Thorold
Canoxy	- Canadianoxy Chemicals Ltd. Fort Erie
Cel	- Celanese Canada Inc. Millhaven
Chin	- Chinook Group Ltd. Sombra
Corn	- Cornwall Chemicals Ltd. Cornwall
Crtcorn	- Courtaulds Fibres Canada Cornwall
Crtna	- Courtaulds North America Lemoyne, AL
Dow Mid	- Dow Chemical Midland, MI
DowS	- Dow Chemical Canada Inc. Sarnia
DupC	- Du Pont Canada Inc. Corunna
DupK	- Du Pont Canada Inc. Kingston
DupM	- Du Pont Canada Inc. Maitland
DupW	- Du Pont Canada Inc. Whitby
Esso	- Esso Chemical Canada Sarnia
Ethyl	- Ethyl Canada Inc. Corunna
Ethyl (P)	- Ethyl's Proposed Treatment System
GE	- G.E. Plastics Canada Ltd. Cobourg
Guard	- Guardsman Products Ltd. Cornwall
Morbern	- Morbern Inc. Cornwall
Nova	- Novacor Chemicals Ltd. Mooretown
OCPSF	- OCPSF Final Regulation
P415	- Public Record Plant No. 415
P913	- Public Record Plant No. 913
P1774	- Public Record Plant No. 1774
Petref	- MISA Petroleum Refining Document
Poly	- Polysar Ltd. Sarnia
Polysar	- Polysar Ltd. Sarnia
PR0200	- Esso MISA Control Point PR 0200
R&H-M	- Rohm and Haas Canada Ltd. Morrisburg
R&H-S	- Rohm and Haas Canada Ltd. West Hill
RMDL	- Regulation Method Detection Limit
RMDL/Intake	- Regulation Method Detection Limit/Intake Water Levels
RREL	- Version No. 4 RREL Treatability Data Base
Stepan	- Stepan Canada Longford Mills
Uniroy	- Uniroyal Chemical Ltd. Elmira
415P	- Public Record Plant No. 415 - Public Comment Submission
415T	- Public Record Plant No. 415 - Twelve Plant Study
725T	- Public Record Plant No. 725 - Twelve Plant Study
913P	- Public Record Plant No. 913 - Public Comment Submission
2680T	- Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

BASF FIBRES INC. - ARNPRIOR

1.0 PLANT DESCRIPTION

The BASF Fibres Inc. plant in Amprior manufactures bulked continuous filament nylon 6 for the carpet industry, nylon 6 polymer for the wire and cable industry and injection moulding applications. The plant, which is situated on a 280 acre site bordered by the Ottawa River to the southeast, operates 365 days a year, 24 hours a day and employs approximately 350 people. It has been in operation since 1966.

The major plant processes for nylon 6 production include the following:

- Polymerization
- Extrusion
- Spinning
- Texturing
- Twisting
- Heat setting
- Recovery

Most of the nylon produced at the plant is finished in the draw texturing, twisting and heat-setting areas as bulked continuous filament for carpet manufacturing. A small percentage of nylon chip is sold directly to plastics industry customers. The plant also has a significant recovery operation which receives waste chips and liquid recovered from various areas of the plant.

Details on the plant processes, water uses and wastewater management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

There are two storm sewers and two sanitary sewers leaving the property. One 24" storm sewer receives the majority of the surface storm water and all of the in-plant generated discharge. This sewer connects to the town storm sewer, which flows directly to the Ottawa River. The only MISA monitoring station is located on this 24" sewer at OT 0100. The second storm sewer is a 12" pipe which drains 20% of the

plant roof area and the back periphery of the plant. This second storm sewer drains to a low lying area east of the plant.

Table 1.0 presents a summary of the process/generating areas discharging wastewater to MISA Control Point OT 0100.

Table 1.0
MISA Monitored Discharges at BASF

Monitor Location	Contributing Process/Generating Area	
OT 0100	Indirect VK	· overhead condenser · after condenser · extruder bearing cooling · dryers
	Direct VK	· overhead condenser · extruder bearing cooling
	Spinning	· extrusion bearing cooling
	Draw Texturing	· compressors
	Heatsetting	· OTCW
	Recovery	· 1st stage evaporator

Most stormwater at BASF is discharged at the OT 0100 monitoring station. The remaining 20% of storm water discharges to a second storm sewer in the back of the plant site. This location is not monitored.

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum pollutant reduction.

Option 3 - a BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

No toxicity data were collected by the plant for submission to the Ministry of Environment because toxicity data collection for MISA Control Point OT 0100 was not required under the MISA regulation. As a result, no additional treatment can be recommended at this time for BAT Option 1.

3.2 BAT OPTION 2

This BAT Option incorporates the best available technologies from similar U.S. and Ontario plants which, if installed, will achieve the maximum overall pollutant reduction. The analytical results obtained from the OCM Sector Twelve Month Report from MISA Control Point OT 0100 indicate the plant's current pollutant discharge levels are as low or lower than discharge levels for similar organic chemical manufacturing plants in the U.S. and Ontario. Therefore, no additional treatment is recommended for BAT Option 2.

3.3 BAT OPTION 3

This option incorporates those technologies that would move the plant furthest toward zero discharge/virtual elimination of contaminants. For MISA Control Point OT 0100, relatively elevated concentrations aluminum (215.8 ug/L) and zinc (79.1 ug/L) as well as low concentrations of DOC, TOC and phenolics (4AAP) which could be incrementally removed are present. Although these reported concentrations are not considered high for a process wastewater, since the discharge to MISA Control Point OT 0100 is primarily non-contact cooling water, multi-media filtration and granular activated carbon

are recommended for control of these contaminants for BAT Option 3.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for this plant.

Table 2.0
Summary of BAT Option for BASF Fibres Inc. -
Arnprior MISA Control Point OT 0100

BAT Option	Definition	Description
1	Non-Lethal Effluent	· No toxicity testing · No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· No additional treatment
3	Zero Discharge/Virtual Elimination	· Multi-media filtration · Granular Activated Carbon

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and cannot be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation, was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending

upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for BASF Fibres Inc. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 2).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for BASF Fibres Inc. - Amprior. The only cost estimates are for granular activated carbon and multimedia filtration at MISA Control Point OT 0100.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
BASF FIBRES, INC. - ARNPRIOR

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
OT 0100	1,206	0	0	NAT	0	0	NAT	639,000	57,300	FIL
								1,759,800	1,406,700	GAC
								2,398,800	1,464,000	TOTAL

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
FIL - Multimedia Filtration

6.0 REFERENCES

1. BASF Fibres Inc.-Arnprior BAT status of OCM Sector Plants Site Visit Information Report, April 12, 1991.

2. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category, (EPA 440/1-87/009, October 1987)

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR BASF FIBRES INC.-ARNPRIOR

OCM SECTOR TWELVE MONTH REPORT – DATA FROM AUG 1/90 TO JULY 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – BASF CANADA INC. – ARNPRIOR

ATG	PARAMETER	RMDL	UNIT	IN 0300	OT 0100
1	COD	10	mg/L	–	–
2	Cyanide Total	0.005	mg/L	–	–
3	Hydrogen ion (pH)			–	7.7
4	Ammonia plus Ammonium	0.25	mg/L	–	–
4	Nitrate + Nitrite	0.25	mg/L	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	1.5
5	DOC	0.5	mg/L	–	5.6
5	TOC	5	mg/L	–	6
6	Total phosphorus	0.10	mg/L	–	0.80
7	Specific conductance	5	uS/cm	–	282
8	Total suspended solids	5	mg/L	–	4
8	Volatile suspended solids	10	mg/L	–	–
9	Aluminum	30.0	ug/L	–	215.8
9	Copper	10.0	ug/L	–	16.5
9	Vanadium	30.0	ug/L	–	35.1
9	Zinc	10.0	ug/L	–	79.1
14	Phenolics (4AAP)	2.0	ug/L	–	3.7
25	Oil and grease	1.0	mg/L	–	0.9
98	Ftflow		m3/day	–	1056

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0300 – Intake Water to Site
OT 0100 – Storm Discharge to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM AUG 1/90 TO JULY 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – BASF CANADA INC. – ARNPRIOR

ATG	PARAMETER	IN 0300	OT 0100	TOTAL
1	COD	–	–	–
2	Cyanide Total	–	–	–
4	Ammonia plus Ammonium	–	–	–
4	Nitrate + Nitrite	–	–	–
4	Total Kjeldahl Nitrogen	–	1.144	1.144
5	DOC	–	5.852	5.852
5	TOC	–	5.888	5.888
6	Total phosphorus	–	0.942	0.942
8	Total suspended solids	–	4.384	4.384
8	Volatile suspended solids	–	–	–
9	Aluminum	–	0.218	0.218
9	Copper	–	0.016	0.016
9	Vanadium	–	0.034	0.034
9	Zinc	–	0.114	0.114
14	Phenolics (4AAP)	–	0.004	0.004
25	Oil and grease	–	1.025	1.025

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation

SAMPLING POINTS
IN 0300 – Intake Water to Site
OT 0100 – Storm Discharge to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
BASF FIBRES INC.-ARNPRIOR

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - BASF CANADA INC. - ARNPRIOR

CONTROL POINT - OT 0100 Storm Discharge to River
AVERAGE FLOWRATE = 1056 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate + Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.5	1.144	1.5	1.144	1.5	1.144	1.5	1.144	BASFArn	BASFArn	BASFArn
5	DOC	0.5	mg/L	5.6	5.852	5.6	5.852	5.6	5.852	4.4	4.646	BASFArn	BASFArn	Esso
5	TOC	5	mg/L	6	5.888	6	5.888	6	5.888	5	5.280	BASFArn	BASFArn	Esso
6	Total phosphorus	0.10	mg/L	0.80	0.942	0.80	0.942	0.80	0.942	0.80	0.942	BASFArn	BASFArn	BASFArn
8	Total suspended solids	5	mg/L	4	4.384	4	4.384	4	4.384	4	4.384	BASFArn	BASFArn	BASFArn
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	215.8	0.218	215.8	0.218	215.8	0.218	47.0	0.050	BASFArn	BASFArn	RREL
9	Copper	10.0	ug/L	16.5	0.016	16.5	0.016	16.5	0.016	16.5	0.016	BASFArn	BASFArn	BASFArn
9	Vanadium	30.0	ug/L	35.1	0.034	35.1	0.034	35.1	0.034	35.1	0.034	BASFArn	BASFArn	BASFArn
9	Zinc	10.0	ug/L	79.1	0.114	79.1	0.114	79.1	0.114	42.0	0.044	BASFArn	BASFArn	RREL
14	Phenolics (4AAP)	2.0	ug/L	3.7	0.004	3.7	0.004	3.7	0.004	2.5	0.003	BASFArn	BASFArn	Esso
25	Oil and grease	1.0	mg/L	0.9	1.025	0.9	1.025	0.9	1.025	0.9	1.025	BASFArn	BASFArn	BASFArn

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

**ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS**

BASF CANADA INC. - SARNIA PLANT

1.0 PLANT DESCRIPTION

The site was originally owned by Polysar. The Number 1 plant was built in 1958 followed by the Number 2 plant in 1968. The Number 1 plant was shutdown in the mid 1970's. In 1988, BASF purchased the site and continues to produce Styrene-Butadiene (SB) latex in the Number 2 plant. The Number 1 plant is used primarily for storage and shipping.

The SB liquid dispersions are used in the paper, textile, flooring, and adhesive industries.

The facility consists of two main plants:

- The Number 2 Latex Plant is situated at the north end of the property and serves as the main manufacturing facility, which produces carboxylated styrene-butadiene latex. Finished or semifinished latex is transferred by pipeline to Number 1 Plant for further processing and storage.

- The Number 1 Plant is used for loading rail cars, tank trucks, and drums.

There is no water, wastewater, or process effluent treatment on the BASF site. All contaminated process and service waters are contained and sent by pipeline for off-site treatment. Spent cooling water and stormwater are discharged to the river through two monitoring points: MISA Control Point OT 0100 and MISA Control Point OT 0200.

Details on the plant production processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Cooling and service water is taken from the St. Clair River via a neighbouring large plant. The main use of this water is for once-through, non-contact cooling in reactor vessels and heat exchangers.

Spent cooling water and stormwater are discharged to the river via the Cole Drain, a local watercourse. Contaminated water is collected with other plant process effluents and sent off-site for treatment and disposal.

There are four separate sewer systems in the plant:

- a process sewer collecting the latex effluent stream, described previously and pumped for off-site treatment.
- a combined storm and cooling water sewer collecting non-contact cooling water, non-contact steam condensate, and roof drains from the Number 2 Plant and surrounding areas. It discharges to the St. Clair River through the MISA Control Point OT 0100 and the Cole Drain.
- a combined storm and cooling water sewer that collects non-contact cooling water, non-contact steam condensate, and roof drains from the Number 1 Plant and surrounding area. It discharges to the St. Clair River through the MISA Control Point OT 0200 and Cole Drain.
- a sanitary sewer, that collects sanitary wastes in three holding tanks. The content of the tanks is periodically pumped out to the City of Sarnia Sanitary Sewer.

Table 1.0 presents a summary of the sources of wastewater at the plant.

TABLE 1.0
SOURCES OF WASTEWATER
BASF CANADA INC. - SARNIA

SOURCE	DESTINATION
Styrene condensate	Off-site Treatment
Latex effluent	Off-site Treatment
Number 2 Plant cooling water condensate and stormwater	Cole Drain via OT 0100
Number 1 Plant cooling water condensate and stormwater	Cole Drain via OT 0200
Sanitary waste	City Sewer

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points OT 0100 and OT 0200.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled, and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed that the plant's two discharges (MISA Control Point OT 0100 and OT 0200) were not acutely lethal. As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. or Ontario plants which, if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report showed that the plant's current pollutant discharge levels are as low or lower than discharge levels for similar organic chemical manufacturing plants in the U.S. and Ontario with the exception of acrylonitrile and styrene at MISA Control Point OT 0100 and oil and grease at MISA Control Point OT 0200. Acrylonitrile and styrene were detected at average concentrations of 3,940.6 ug/l and 71.1 ug/l, respectively, while oil and grease was detected at an average concentration of 6.1 mg/l.

The recommended technology for control of acrylonitrile is steam stripping; while the levels of styrene are not considered high for a process wastewater, since MISA Control Point 0100 receives primarily non-

contact cooling water, control of styrene is recommended. This is accomplished through its incidental removal in the steam stripper installed for removal of acrylonitrile.

The source of oil and grease in the MISA Control Point OT 0200 discharge is not known. Since MISA Control Point OT 0200 only receives non-contact cooling water and stormwater runoff and not process wastewater, it is likely that it is some non-point source of the plant site. Since the concentration of oil and grease is low enough to make installation of oil separation ineffective, a Best Management Practices (BMP) Plan to identify the sources and suggest methods of control for oil and grease is also recommended for BAT Option 2.

A draft report prepared by Environment Canada provides guidelines for developing and implementing BMP's plans (Ref. 2).

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would provide virtual elimination of contaminants and would move the plant furthest toward zero discharge. A search which included any current technology or combination of current technologies including supplemental/add-on technologies or cross-over technologies from other industrial sectors was carried out as part of this study. Based on the contaminants present in the effluents after implementation of BAT Option 2, no significant improvement in effluent quality can be expected with the addition of any current technology or combination of current technologies employed by OCM Sector plants or any other industrial sector.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for this plant.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR
BASF CANADA INC. - SARNIA PLANT

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-Lethal Effluent	· No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Steam Stripping at OT 0100. · BMP's for oil and grease at OT 0200.
3	Zero Discharge/Virtual Elimination	· Same as Option 2

4.0 PERFORMANCE DATA OF SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT Options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report, plus one standard deviation, was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates; depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for BASF Canada Inc. - Sarnia Plant were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 3).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for BASF Canada Inc. The only cost estimate is for steam stripping at MISA Control Point OT 0100. Cost estimates for development and implementation of a BMP plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
BASF CANADA INC. - SARNIA

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
OT 0100	12,290	0	0	NAT	2,951,900	18,131,200	Steam Stripping	2,951,900	18,131,200	Steam Stripping
OT 0200	--	0	0	NAT	NA	NA	BMP's	0	0	BMP's

NOTES:

NAT - No additional treatment
NA - Not available

6.0 REFERENCES

1. BASF Canada Inc. - Sarnia Plant. BAT Status of the OCM Sector Plants Site Visit Information Report, April 25, 1991.

2. J.S. Shrives, Oil, Gas & Energy Division, Industrial Program Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Application to Ontario's MISA Program", May 1987.

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987)

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR BASF CANADA INC. - SARNIA

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – BASF CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0500	OT 0100	OT 0200
1	COD	10	mg/L	–	–	–
2	Cyanide Total	0.005	mg/L	–	–	–
3	Hydrogen ion (pH)			7.7	7.7	7.7
4	Ammonia plus Ammonium	0.25	mg/L	0.20	0.20	0.20
4	Nitrate + Nitrite	0.25	mg/L	–	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.36	0.42	0.47
5	DOC	0.5	mg/L	1.9	1.9	1.7
5	TOC	5	mg/L	2	4	2
6	Total phosphorus	0.10	mg/L	0.10	0.09	0.10
7	Specific conductance	5	uS/cm	182	192	191
8	Total suspended solids	5	mg/L	3	5	8
8	Volatile suspended solids	10	mg/L	–	–	–
9	Aluminum	30.0	ug/L	30.0	40.8	32.5
9	Copper	10.0	ug/L	12.9	10.8	11.7
9	Lead	30.0	ug/L	30.0	32.5	35.0
9	Zinc	10.0	ug/L	20.0	21.7	22.5
14	Phenolics (4AAP)	2.0	ug/L	5.3	2.3	4.0
17	Ethylbenzene	0.6	ug/L	0.2	7.6	0.3
17	Styrene	0.5	ug/L	1.1	71.1	0.4
17	Toluene	0.5	ug/L	1.2	1.0	0.4
18	Acrylonitrile	4.2	ug/L	0.8	3940.6	2.7
25	Oil and grease	1.0	mg/L	1.1	1.2	6.7
98	Ftflow		m3/day	10549	9378	210

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation

(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS

IN 0500 – Intake Water to Site

OT 0100 – #2 Plant Storm Sewer to River

OT 0200 – #1 Plant Storm Sewer to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – BASF CANADA INC. – SARNIA

ATG	PARAMETER	IN 0500	OT 0100	OT 0200	TOTAL
1	COD	–	–	–	–
2	Cyanide Total	–	–	–	–
4	Ammonia plus Ammonium	2.110	1.876	0.042	1.918
4	Nitrate + Nitrite	–	–	–	–
4	Total Kjeldahl Nitrogen	3.571	3.931	0.097	4.028
5	DOC	20.449	17.935	0.362	18.297
5	TOC	22.224	50.329	0.470	50.799
6	Total phosphorus	1.055	0.879	0.021	0.900
8	Total suspended solids	35.255	46.708	1.782	48.490
8	Volatile suspended solids	–	–	–	–
9	Aluminum	0.335	0.420	0.007	0.427
9	Copper	0.136	0.100	0.002	0.102
9	Lead	0.316	0.307	0.007	0.314
9	Zinc	0.219	0.227	0.004	0.231
14	Phenolics (4AAP)	0.049	0.023	0.001	0.024
17	Ethylbenzene	0.002	0.056	*	0.056
17	Styrene	0.010	0.511	*	0.511
17	Toluene	0.010	0.008	*	0.008
18	Acrylonitrile	0.008	29.688	0.001	29.689
25	Oil and grease	12.195	11.047	1.585	12.632

EXPLANATORY NOTES:
(i) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0500 – Intake Water to Site
OT 0100 – #2 Plant Storm Sewer to River
OT 0200 – #1 Plant Storm Sewer to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
BASF CANADA INC. - SARNIA

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - BASF CANADA INC. - SARNIA

CONTROL POINT - OT 0100 #2 Plant Storm Sewer to River
AVERAGE FLOWRATE = 9378 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	0.20	1.876	0.20	1.876	0.20	1.876	0.20	1.876	BASFS	BASFS	BASFS
4	Nitrate + Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.42	3.931	0.42	3.931	0.42	3.931	0.42	3.931	BASFS	BASFS	BASFS
5	DOC	0.5	mg/L	1.9	17.935	1.9	17.935	1.9	17.935	1.9	17.935	BASFS	BASFS	BASFS
5	TOC	5	mg/L	4	50.329	4	50.329	4	50.329	4	50.329	BASFS	BASFS	BASFS
6	Total phosphorus	0.10	mg/L	0.09	0.879	0.09	0.879	0.09	0.879	0.09	0.879	BASFS	BASFS	BASFS
8	Total suspended solids	5	mg/L	5	46.708	5	46.708	5	46.708	5	46.708	BASFS	BASFS	BASFS
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	40.8	0.420	40.8	0.420	40.8	0.420	40.8	0.420	BASFS	BASFS	BASFS
9	Copper	10.0	ug/L	10.8	0.100	10.8	0.100	10.8	0.100	10.8	0.100	BASFS	BASFS	BASFS
9	Lead	30.0	ug/L	32.5	0.307	32.5	0.307	32.5	0.307	32.5	0.307	BASFS	BASFS	BASFS
9	Zinc	10.0	ug/L	21.7	0.227	21.7	0.227	21.7	0.227	21.7	0.227	BASFS	BASFS	BASFS
14	Phenolics (4AAP)	2.0	ug/L	2.3	0.023	2.3	0.023	2.3	0.023	2.3	0.023	BASFS	BASFS	BASFS
17	Ethylbenzene	0.6	ug/L	7.6	0.056	7.6	0.056	7.6	0.056	7.6	0.056	BASFS	BASFS	BASFS
17	Styrene	0.5	ug/L	71.1	0.511	71.1	0.511	16.0	0.150	16.0	0.150	BASFS	RREL	RREL
17	Toluene	0.5	ug/L	1.0	0.008	1.0	0.008	1.0	0.008	1.0	0.008	BASFS	BASFS	BASFS
18	Acrylonitrile	4.2	ug/L	3940.6	29.688	3940.6	29.688	ND(50)	0.469	ND(50)	0.469	BASFS	RREL	RREL
25	Oil and grease	1.0	mg/L	1.2	11.047	1.2	11.047	1.2	11.047	1.2	11.047	BASFS	BASFS	BASFS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - BASF CANADA INC. - SARNIA

OT 0200 - #1 Plant Storm Sewer to River
AVERAGE FLOWRATE = 210 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	0.20	0.042	0.20	0.042	0.20	0.042	0.20	0.042	BASFS	BASFS	BASFS
4	Nitrate + Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.47	0.097	0.47	0.097	0.47	0.097	0.47	0.097	BASFS	BASFS	BASFS
5	DOC	0.5	mg/L	1.7	0.362	1.7	0.362	1.7	0.362	1.7	0.362	BASFS	BASFS	BASFS
5	TOC	5	mg/L	2	0.470	2	0.470	2	0.470	2	0.470	BASFS	BASFS	BASFS
6	Total phosphorus	0.10	mg/L	0.10	0.021	0.10	0.021	0.10	0.021	0.10	0.021	BASFS	BASFS	BASFS
8	Total suspended solids	5	mg/L	8	1.782	8	1.782	8	1.782	8	1.782	BASFS	BASFS	BASFS
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	32.5	0.007	32.5	0.007	32.5	0.007	32.5	0.007	BASFS	BASFS	BASFS
9	Copper	10.0	ug/L	11.7	0.002	11.7	0.002	11.7	0.002	11.7	0.002	BASFS	BASFS	BASFS
9	Lead	30.0	ug/L	35.0	0.007	35.0	0.007	35.0	0.007	35.0	0.007	BASFS	BASFS	BASFS
9	Zinc	10.0	ug/L	22.5	0.004	22.5	0.004	22.5	0.004	22.5	0.004	BASFS	BASFS	BASFS
14	Phenolics (4AAP)	2.0	ug/L	4.0	0.001	4.0	0.001	4.0	0.001	4.0	0.001	BASFS	BASFS	BASFS
17	Ethylbenzene	0.6	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	BASFS	BASFS	BASFS
17	Styrene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	BASFS	BASFS	BASFS
17	Toluene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	BASFS	BASFS	BASFS
18	Acrylonitrile	4.2	ug/L	2.7	0.001	2.7	0.001	2.7	0.001	2.7	0.001	BASFS	BASFS	BASFS
25	Oil and grease	1.0	mg/L	6.7	1.585	6.7	1.585	4.1	0.861	4.1	0.861	BASFS	BMPs^	BMPs^

* - Less than 1 gram per day

^ - Loadings based on projected BAT performance obtained from Amoco

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

CANADIANOXY CHEMICALS, LTD.

1.0 PLANT DESCRIPTION

Canadianoxy Chemicals Ltd. manufactures phenol-formaldehyde (P/F) resin from raw material manufactured elsewhere. The plant also manufactures powdered resins and blends additives with resin to manufacture moulding compounds.

The company's products are used in electrical appliances, housing, automotive applications, and foundry binders. Automotive applications include binders for brake pads and shoes, brake system parts, in tire manufacture for extending wear life, and as tackifiers for enhanced ply adhesion.

Reaction water from the P/F resin kettles is distilled off, stored and shipped off-site for treatment or disposal. All other processes are dry. Cooling water from the P/F resin area is recycled through cooling towers. Miscellaneous non-contact cooling water from other areas of the plant and stormwater are discharged without treatment through a single outfall to Frenchman's Creek and subsequently to the Niagara River (MISA Control Point OT 0100).

Canadianoxy does not employ any treatment of its OT 0100 discharge; however, roof drain water from Building No. 3 is collected and treated via carbon adsorption prior to being reused as cooling water make-up. The cooling water for the resin flaker belt which was a major source of phenol contamination in the plant effluent was closed-looped in February 1989.

Details on the plant processes, water uses, and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

The plant's only direct discharge (MISA Control Point OT 0100) receives non-contact cooing water and stormwater runoff. All process wastewaters are held for off-site biotreatment or disposal. Contaminated

stormwater is treated with activated carbon, reused in cooling towers, and ultimately blown down to the sanitary city sewer.

Table 1.0 summarizes wastewater generation at the site and indicates its destination.

TABLE 1.0
WASTEWATER AND COOLING WATER SOURCES FOR CANADIANOXY CHEMICALS, LTD.

SOURCE DESCRIPTION	DESTINATION
Process Distillate	Off-site for biotreatment or to incineration
OTCW (Bldg. 4)	Sanitary Sewer
Cooling tower blowdown Non-contact cooling (Bldg. 3) Contaminated stormwater (Bldg. 3 area)	Sanitary Sewer
Boiler Blowdown	Sanitary Sewer
Sanitary Wastewater	Sanitary Sewer
OTCW Utilities Bldg.	Discharge OT 0100
Storm runoff from "non-contaminated" areas	Discharge OT 0100

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results for MISA Control Point OT 0100 as obtained from the MISA OCM Sector Twelve Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors,

which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed that the plant's only direct discharge was not acutely lethal. As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report from MISA Control Point OT 0100 indicate the plant's current pollutant discharge levels are as low or lower than discharge levels for similar organic manufacturing plants in the U.S. and Ontario with the exception of elevated concentrations of phenolics (4AAP) and aluminum. The average concentration of phenolics was reported at 33.6 ug/l, while the average effluent concentration of aluminum was reported at 155.0 ug/l. Although the reported concentrations of these contaminants are not considered high for a process wastewater, since wastewater discharged to MISA Control Point OT 0100 is mostly non-contact cooling water, multi-media filtration and granular activated carbon are recommended for control of phenolics (4AAP) and aluminum.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. Technologies considered under this option include any current technology or combination of current technologies, including supplemental or cross-over technologies from other industrial sector. Based on the contaminant levels in the effluent after implementation of BAT Option 2, no significant improvement in effluent quality can be expected with the addition of any current technology or combination of current technologies employed by OCM Sector plants or any other industrial sector.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for this plant.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR THE BAT OPTION RECOMMENDED FOR THIS PLANT

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-Lethal effluent	· No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Multimedia Filtration · Granular Activated Carbon
3	Zero Discharge/Virtual Elimination	· Same as Option 2

4.0 PERFORMANCE DATA OF SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT Options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT Option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report, plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates; depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Canadianoxy Chemicals, Ltd. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 2).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for Canadianoxy Chemicals, Ltd. The only cost estimate is for multi-media filtration and granular activated carbon at MISA Control Point OT 0100. Cost estimates for development and implementation of a BMP plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES[A]
CANADIANOXY CHEMICALS, LTD.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTIONS 2 and 3[B]		
		CAPITAL	O&M	TECHNOLOGY
OT 0100	138	347,100	190,400	GAC
		422,800	38,400	FIL
		769,900	228,800	TOTAL

NOTES:

GAC - Granular Activated Carbon
FIL - Multi-media Filtration
(A) - There are no costs associated with BAT Option 1
(B) - Cost estimate for BAT Option 2 is identical for BAT Option 3

6.0 REFERENCES

1. Canadianoxy Chemicals, Ltd. BAT Status of the OCM Sector Plants Site Visit Information Report, April 25, 1991.

2. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987)

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR CANADIANOXY CHEMICALS, LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – CANADIANOXY CHEMICALS LTD. – FORT ERIE

ATG	PARAMETER	RMDL	UNIT	IN 0400	OT 0100
1	COD	10	mg/L	–	–
2	Cyanide Total	0.005	mg/L	–	–
3	Hydrogen ion (pH)			7.9	8.0
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.12
4	Nitrate + Nitrite	0.25	mg/L	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	0.5
5	DOC	0.5	mg/L	1.4	2.4
5	TOC	5	mg/L	1	3
6	Total phosphorus	0.10	mg/L	0.01	0.02
7	Specific conductance	5	uS/cm	306	604
8	Total suspended solids	5	mg/L	2	6
8	Volatile suspended solids	10	mg/L	–	–
9	Aluminum	30.0	ug/L	125.0	155.0
9	Chromium	20.0	ug/L	7.0	32.0
9	Zinc	10.0	ug/L	8.5	26.6
14	Phenolics (4AAP)	2.0	ug/L	1.0	33.6
25	Oil and grease	1.0	mg/L	1.0	1.8
98	Ftflow		m3/day	–	76

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation.
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0400 – Intake Water to Site
OT 0100 – Final Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – CANADIANOXY CHEMICALS LTD. – FORT ERIE

ATG	PARAMETER	IN 0400	OT 0100	TOTAL
1	COD	–	–	–
2	Cyanide Total	–	–	–
4	Ammonia plus Ammonium	0.003	0.012	0.012
4	Nitrate + Nitrite	–	–	–
4	Total Kjeldahl Nitrogen	0.022	0.048	0.048
5	DOC	0.148	0.190	0.190
5	TOC	0.148	0.173	0.173
6	Total phosphorus	0.001	0.001	0.001
8	Total suspended solids	0.215	0.343	0.343
8	Volatile suspended solids	–	–	–
9	Aluminum	0.014	0.014	0.014
9	Chromium	0.001	0.002	0.002
9	Zinc	0.001	0.002	0.002
14	Phenolics (4AAP)	*	0.004	0.004
25	Oil and grease	0.108	0.139	0.139

EXPLANATORY NOTES:
(i) "*" loading less than 1 gram/day

SAMPLING POINTS:
OT 0100 – Final Effluent to River
IN 0400 – Intake Water to Site

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
CANADIANOXY CHEMICALS, LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CANADIANOXY CHEMICALS LTD. - FORT ERIE

CONTROL POINT - OT 0100 Final Effluent to River
AVERAGE FLOWRATE = 76 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	0.12	0.012	0.12	0.012	0.12	0.012	0.12	0.012	CANOXY	CANOXY	CANOXY
4	Nitrate + Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	0.048	0.5	0.048	0.5	0.048	0.5	0.048	CANOXY	CANOXY	CANOXY
5	DOC	0.5	mg/L	2.4	0.190	2.4	0.190	2.4	0.190	2.4	0.190	CANOXY	CANOXY	CANOXY
5	TOC	5	mg/L	3	0.173	3	0.173	3	0.173	3	0.173	CANOXY	CANOXY	CANOXY
6	Total phosphorus	0.10	mg/L	0.02	0.001	0.02	0.001	0.02	0.001	0.02	0.001	CANOXY	CANOXY	CANOXY
8	Total suspended solids	5	mg/L	6	0.343	6	0.343	6	0.343	5	0.380	CANOXY	CANOXY	P1774
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	155.0	0.014	155.0	0.014	47.0	0.004	47.0	0.004	CANOXY	RREL	RREL
9	Chromium	20.0	ug/L	32.0	0.002	32.0	0.002	17.0	0.001	17.0	0.001	CANOXY	RREL	RREL
9	Zinc	10.0	ug/L	26.6	0.002	26.6	0.002	26.6	0.002	26.6	0.002	CANOXY	CANOXY	CANOXY
14	Phenolics (4AAP)	2.0	ug/L	33.6	0.004	33.6	0.004	2.5	*	2.5	*	CANOXY	Esso	Esso
25	Oil and grease	1.0	mg/L	1.8	0.139	1.8	0.139	1.8	0.139	1.8	0.139	CANOXY	CANOXY	CANOXY

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

CELANESE CANADA INC.

1.0 PLANT DESCRIPTION

The Celanese Canada Inc. Plant is located about 20 kilometers west of Kingston, on the shore of Lake Ontario. The plant operates seven days a week (two 12-hour shifts) and employs approximately 630 people.

Celanese Canada Inc. is 56 percent owned by Hoechst-Celanese U.S., which is wholly owned by HOECHST AG as a result of the acquisition of Celanese in the late 1980's.

Plant operations started in 1954 as a pilot production of polyester and were fully developed in the mid-1960's and early 1970's. Presently, Celanese operates two production units that produce staple fibre polyester and a continuous filament polyester called heavy decitex industrial (HDI). Both production units use an identical continuous process with the exception of filament size, additives, and final product specification. The current product mix is split approximately 70/30 percent between staple fibre and HDI.

The staple fibre production unit produces cut and baled strands of polyester fiber predominately for the textile industry and carpet manufacturers. The HDI production unit produces continuous strands of polyester fiber wound onto tubes or beams for the heavy industrial trade, such as tire, belting, and seat belt manufacturers.

Details on the plant processes, water uses, and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Table 1.0 presents the sources of wastewater in the plant and their destinations.

TABLE 1.0 SOURCES OF WASTEWATER	
SOURCE	DESTINATION
Contact cooling and process wastewater, sanitary wastes	Process Wastewater Treatment Plant (PR 0400)
Waste spin finishes and finish makeup area	Process Wastewater Treatment Plant (PR 0400)
Non-contact once through cooling and air conditioning water	Lake Ontario through East, West, and Centre Outfalls
Stormwater	Lake Ontario through East, West, and Centre Outfalls
Emergency overflow	Lake Ontario through Centre Outfall

Liquid wastes from the plant site are collected in four separate sewer systems:

- a non-contact cooling, air conditioning, and stormwater run-off sewer that is discharged directly to Lake Ontario through three outfalls.

- a contact cooling and process wastewater sewer that is discharged to the Process Wastewater Treatment Plant (PWWTP).

- a wasted spin finish sewer that is discharged to the Process Wastewater Treatment Plant.

- a sanitary sewer that is discharged through rotating screens to the Process Wastewater Treatment Plant.

There are three outfalls from the plant. They are described below:

- Centre Outfall (MISA CO 0100)

  This outfall discharges non-contact cooling water, the effluent from the Process Wastewater Treatment Plant (MISA PR 0400), and stormwater. An emergency overflow from the PWWTP influent pump house also enters this outfall (MISA EM 0500). The Centre Outfall discharges twenty feet below the surface of Lake Ontario.

- West Outfall (MISA CO 0200)

  This outfall starts as an underground pipe and discharges non-contact cooling and air conditioning water from the staple fibre production unit, power house, and storm drains surrounding this area. It passes into a spill containment pond and then flows in an open ditch. A stormwater ditch covering the west side of the site, the neighboring western property, and Taylor-Kidd Blvd. joins the outfall ditch prior to discharge to Lake Ontario.

- East Outfall (MISA CO 0300)

  The main constituent of this open ditch outfall is the non-contact cooling and air conditioning water from the HDI production area and stormwater from the HDI building and surrounding area. A natural watercourse enters from the north and provides surface run-off from the east and north areas on and off-site, including Jim Snow Drive and Taylor-Kidd Blvd. A second watercourse joins the East Outfall just before it discharges to Lake Ontario.

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 0400, CO 0100, CO 0200 and CO 0300.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of Environment during the MISA Twelve Month Monitoring Period showed that the plant's effluent was not acutely lethal. As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction. The analytical results obtained from the OCM Sector Twelve Month Report indicate that the plant's current pollutant discharge levels are as low or lower than discharge levels for similar organic chemical manufacturing plants in the U.S. and Ontario. Therefore, no additional treatment is recommended for BAT Option 2.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and zero discharge of contaminants. For this option, technologies were not identified beyond those currently employed at the plant for the MISA Control Points CO 0100, CO 0200, and CO 0300. However, the draft analytical results of the MISA monitoring at MISA Control Point PR 0400 showed relatively elevated concentrations of DOC, TOC, TSS and some metals, particularly antimony. Granular activated carbon and multimedia filtration are recommended for the control of these contaminants at MISA Control Point PR 0400.

3.4 SUMMARY

Table 2.0 presents a summary of BAT Options recommended for Celanese Canada Inc.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR CELANESE CANADA INC.

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-Lethal Effluent	No additional treatment
2	USA/Ontario BAT/ Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	PR 0400: Multi-media Filtration and Granular Activated Carbon CO 0200- No additional treatment CO 0300- No additional treatment CO 0400- No additional treatment

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also presented in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report, plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste- specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for the Celanese Millhaven Plant were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 2).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for Celanese, Canada, Inc. The only cost estimate is for granular activated carbon and multi-media filtration at MISA Control Point PR 0400.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES[1]
CELANESE CANADA INC.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 3 CAPITAL	BAT OPTION 3 O&M	TECHNOLOGY
PR 0400	4,829	8,962,100 1,042,500 10,004,600	688,800 83,000 771,800	Granular Activated Carbon Multimedia Filtration Total
CO 0200	51,506	0	0	NAT
CO 0300	37,807	0	0	NAT
CO 0400	16,005	0	0	NAT

NOTES:

(1) There are no costs associated with BAT Options 1 and 2
NAT No Additional Treatment

6.0 REFERENCES

1. Celanese Canada Inc. - BAT status of the OCM Sector Plants Site Visit Report, April 1, 1991.

2. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR CELANESE CANADA INC.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – CELANESE CANADA INC. – MILLHAVEN

ATG	PARAMETER	RMDL	UNIT	IN 0900	PR 0400	CO 0100	CO 0200	CO 0300
1	COD	10	mg/L	14	30	19	9	9
2	Cyanide Total	0.005	mg/L	0.004	0.003	0.004	0.003	0.003
3	Hydrogen ion (pH)			8.1	8.1	8.1	8.2	8.2
4	Ammonia plus Ammonium	0.25	mg/L	0.05	1.28	0.27	0.05	0.05
4	Nitrate+Nitrite	0.25	mg/L	0.35	2.81	1.02	0.35	0.34
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	2.3	0.6	0.4	0.3
5	DOC	0.5	mg/L	2.7	6.7	4.7	2.8	2.4
5	TOC	5	mg/L	3	13	6	3	3
6	Total phosphorus	0.10	mg/L	0.03	1.13	0.44	0.03	0.05
7	Specific conductance	5	uS/cm	315	443	386	319	318
8	Total suspended solids	5	mg/L	9	7	5	3	2
8	Volatile suspended solids	10	mg/L	5	7	5	3	3
9	Aluminum	30.0	ug/L	86.1	53.1	51.7	46.7	53.3
9	Copper	10.0	ug/L	9.7	10.9	5.7	13.1	5.6
9	Zinc	10.0	ug/L	14.0	17.4	9.5	21.5	13.9
10	Antimony	5.0	ug/L	1.0	71.3	35.9	1.0	5.0
11	Chromium (hexavalent)	10.0	ug/L	17.4	12.8	10.5	6.9	6.1
12	Mercury	0.10	ug/L	0.06	0.07	0.07	0.06	0.06
14	Phenolics (4AAP)	2.0	ug/L	0.6	0.8	0.8	0.9	1.4
15	Sulphide	20.0	ug/L	9.0	17.3	24.3	11.0	20.3
16	1,2–Dichloroethane	0.8	ug/L	0.7	0.7	0.7	0.7	0.7
16	Bromodichloromethane	0.8	ug/L	0.3	7.5	1.9	0.3	0.3
16	Chloroform	0.7	ug/L	0.9	0.8	1.3	1.1	1.7
16	Chloromethane	3.7	ug/L	16.1	1.4	1.5	1.2	1.7
16	Methylene chloride	1.3	ug/L	3.3	1.2	2.9	2.2	2.5
17	Benzene	0.5	ug/L	0.4	0.4	0.5	1.3	0.5
17	Toluene	0.5	ug/L	0.4	0.3	0.2	0.3	0.3
19	Biphenyl	0.6	ug/L	0.2	0.2	0.2	0.2	1.1
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	0.3	1.6	1.5	0.3	3.4
19	Di–n–butyl phthalate	3.8	ug/L	0.8	4.5	4.0	10.6	4.4
23	1,2,3,4–Tetrachlorobenzene	10.0	ng/L	37.5	1.2	1.7	1.2	1.2
23	1,2,3,5–Tetrachlorobenzene	10.0	ng/L	6.3	2.1	2.1	2.1	2.1
23	1,2,3–Trichlorobenzene	10.0	ng/L	40.9	3.2	3.4	3.2	3.2
23	1,2,4–Trichlorobenzene	10.0	ng/L	134.9	4.0	5.9	7.5	1.8
23	Pentachlorobenzene	10.0	ng/L	4.4	1.1	1.1	1.1	1.1
24	Octachlorodibenzo–p–dioxin	30.0	ng/L	23.0	69.0	20.0	20.3	20.3
25	Oil and grease	1.0	mg/L	1.5	1.4	1.1	1.1	1.1
98	Ftflow		m3/day	80678	4023	12019	36741	27042

EXPLANATORY NOTES:

(i) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(ii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS:

IN 0900 – Intake Water to Site
PR 0400 – Treatment Plant Effluent flows into CO 0100
CO 0100 – Centre Outfall to Lake
CO 0200 – West Outfall to Lake
CO 0300 – East Outfall to Lake

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – CELANESE CANADA INC. – MILLHAVEN

ATG	PARAMETER	IN 0900	PR 0400	CO 0100	CO 0200	CO 0300	TOTAL
1	COD	1046.914	123.436	203.084	307.719	224.347	735.150
2	Cyanide Total	0.269	0.012	0.050	0.106	0.081	0.237
4	Ammonia plus Ammonium	3.745	5.491	2.430	1.808	1.607	5.845
4	Nitrate+Nitrite	27.955	10.826	12.476	12.571	10.458	35.505
4	Total Kjeldahl Nitrogen	24.942	9.715	6.823	12.764	9.264	28.851
5	DOC	195.814	26.757	54.268	92.504	62.644	209.416
5	TOC	245.941	56.878	67.368	109.335	92.822	269.525
6	Total phosphorus	1.948	4.403	5.126	0.892	1.218	7.236
8	Total suspended solids	724.437	30.744	51.191	116.279	65.144	232.614
8	Volatile suspended solids	373.581	30.012	69.179	107.594	89.374	266.147
9	Aluminum	6.012	0.205	0.592	1.557	1.095	3.244
9	Copper	0.955	0.042	0.071	0.453	0.131	0.655
9	Zinc	1.117	0.067	0.107	0.862	0.246	1.215
10	Antimony	0.078	0.239	0.425	0.038	0.179	0.642
11	Chromium (hexavalent)	1.147	0.051	0.099	0.201	0.130	0.430
12	Mercury	0.005	*	0.001	0.003	0.001	0.005
14	Phenolics (4AAP)	0.045	0.003	0.009	0.031	0.035	0.075
15	Sulphide	0.647	0.065	0.260	0.400	0.578	1.238
16	1,2–Dichloroethane	0.057	0.003	0.008	0.025	0.018	0.051
16	Bromodichloromethane	0.023	0.027	0.029	0.010	0.011	0.050
16	Chloroform	0.062	0.003	0.012	0.031	0.044	0.087
16	Chloromethane	1.443	0.005	0.018	0.049	0.017	0.084
16	Methylene chloride	0.233	0.005	0.031	0.092	0.052	0.175
17	Benzene	0.033	0.002	0.005	0.038	0.014	0.057
17	Toluene	0.028	0.001	0.003	0.010	0.008	0.021
19	Biphenyl	0.015	0.001	0.002	0.005	0.027	0.034
19	Bis(2–ethylhexyl) phthalate	0.025	0.006	0.012	0.011	0.100	0.123
19	Di–n–butyl phthalate	0.067	0.017	0.034	0.253	0.128	0.415
23	1,2,3,4–Tetrachlorobenzene	0.002	*	*	*	*	*
23	1,2,3,5–Tetrachlorobenzene	*	*	*	*	*	*
23	1,2,3–Trichlorobenzene	0.002	*	*	*	*	*
23	1,2,4–Trichlorobenzene	0.007	*	*	*	*	*
23	Pentachlorobenzene	*	*	*	*	*	*
24	Octachlorodibenzo–p–dioxin	*	*	*	*	*	*
25	Oil and grease	94.016	5.569	14.318	38.204	28.136	80.658

EXPLANATORY NOTES:
(i) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0900 – Intake Water to Site
PR 0400 – Treatment Plant Effluent flows into CO 0100
CO 0100 – Centre Outfall to Lake
CO 0200 – West Outfall to Lake
CO 0300 – East Outfall to Lake

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
CELANESE CANADA INC.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CELANESE CANADA INC. - MILLHAVEN

CONTROL POINT - PR 0400 Treatment Plant Effluent flows into CO 0100
AVERAGE FLOWRATE = 4023 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	30	123.436	30	123.436	30	123.436	30	123.436	Cel	Cel	Cel
2	Cyanide Total	0.005	mg/L	0.003	0.012	0.003	0.012	0.003	0.012	0.003	0.012	Cel	Cel	Cel
4	Ammonia plus Ammonium	0.25	mg/L	1.28	5.491	1.28	5.491	1.28	5.491	1.28	5.491	Cel	Cel	Cel
4	Nitrate+Nitrite	0.25	mg/L	2.81	10.826	2.81	10.826	2.81	10.826	2.81	10.826	Cel	Cel	Cel
4	Total Kjeldahl Nitrogen	0.5	mg/L	2.3	9.715	2.3	9.715	2.3	9.715	2.3	9.715	Cel	Cel	Cel
5	DOC	0.5	mg/L	6.7	26.757	6.7	26.757	6.7	26.757	4.4	17.701	Cel	Cel	Esso
5	TOC	5	mg/L	13	56.878	13	56.878	13	56.878	5.0	20.115	Cel	Cel	Esso
6	Total phosphorus	0.10	mg/L	1.13	4.403	1.13	4.403	1.13	4.403	1.13	4.403	Cel	Cel	Cel
8	Total suspended solids	5	mg/L	7	30.744	7	30.744	7	30.744	5	20.115	Cel	Cel	P1774
8	Volatile suspended solids	10	mg/L	7	30.012	7	30.012	7	30.012	5	20.115	Cel	Cel	P1774
9	Aluminum	30.0	ug/L	53.1	0.205	53.1	0.205	53.1	0.205	47.0	0.189	Cel	Cel	RREL
9	Copper	10.0	ug/L	10.9	0.042	10.9	0.042	10.9	0.042	10.9	0.042	Cel	Cel	Cel
9	Zinc	10.0	ug/L	17.4	0.067	17.4	0.067	17.4	0.067	17.4	0.067	Cel	Cel	Cel
10	Antimony	5.0	ug/L	71.3	0.239	71.3	0.239	71.3	0.239	40.0	0.161	Cel	Cel	RREL
11	Chromium (hexavalent)	10.0	ug/L	12.8	0.051	12.8	0.051	12.8	0.051	12.8	0.051	Cel	Cel	Cel
12	Mercury	0.10	ug/L	0.07	*	0.07	*	0.07	*	0.07	*	Cel	Cel	Cel
14	Phenolics (4AAP)	2.0	ug/L	0.8	0.003	0.8	0.003	0.8	0.003	0.8	0.003	Cel	Cel	Cel
15	Sulphide	20.0	ug/L	17.3	0.065	17.3	0.065	17.3	0.065	17.3	0.065	Cel	Cel	Cel
16	1,2-Dichloroethane	0.8	ug/L	0.7	0.003	0.7	0.003	0.7	0.003	0.7	0.003	Cel	Cel	Cel
16	Bromodichloromethane	0.8	ug/L	7.5	0.027	7.5	0.027	7.5	0.027	0.4	*	Cel	Cel	Esso
16	Chloroform	0.7	ug/L	0.8	0.003	0.8	0.003	0.8	0.003	0.8	0.003	Cel	Cel	Cel
16	Chloromethane	3.7	ug/L	1.4	0.005	1.4	0.005	1.4	0.005	1.4	0.005	Cel	Cel	Cel
16	Methylene chloride	1.3	ug/L	1.2	0.005	1.2	0.005	1.2	0.005	1.2	0.005	Cel	Cel	Cel
17	Benzene	0.5	ug/L	0.4	0.002	0.4	0.002	0.4	0.002	0.4	0.002	Cel	Cel	Cel
17	Toluene	0.5	ug/L	0.3	0.001	0.3	0.001	0.3	0.001	0.3	0.001	Cel	Cel	Cel
19	Biphenyl	0.6	ug/L	0.2	0.001	0.2	0.001	0.2	0.001	0.2	0.001	Cel	Cel	Cel
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.6	0.006	1.6	0.006	1.6	0.006	1.6	0.006	Cel	Cel	Cel
19	Di-n-butyl phthalate	3.8	ug/L	4.5	0.017	4.5	0.017	4.5	0.017	4.5	0.017	Cel	Cel	Cel
23	1,2,3,4-Tetrachlorobenzene	10.0	ng/L	1.2	*	1.2	*	1.2	*	1.2	*	Cel	Cel	Cel
23	1,2,3,5-Tetrachlorobenzene	10.0	ng/L	2.1	*	2.1	*	2.1	*	2.1	*	Cel	Cel	Cel
23	1,2,3-Trichlorobenzene	10.0	ng/L	3.2	*	3.2	*	3.2	*	3.2	*	Cel	Cel	Cel
23	1,2,4-Trichlorobenzene	10.0	ng/L	4.0	*	4.0	*	4.0	*	4.0	*	Cel	Cel	Cel
23	Pentachlorobenzene	10.0	ng/L	1.1	*	1.1	*	1.1	*	1.1	*	Cel	Cel	Cel
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	46.0	*	46.0	*	46.0	*	46.0	*	Cel	Cel	Cel
25	Oil and grease	1.0	mg/L	1.4	5.569	1.4	5.569	1.4	5.569	1.4	5.569	Cel	Cel	Cel

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CELANESE CANADA INC. - MILLHAVEN

CONTROL POINT - CO 0100 Centre Outfall to Lake
AVERAGE FLOWRATE = 12019 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	19	203.084	19	203.084	19	203.084	19	203.084	CEL	CEL	CEL
2	Cyanide Total	0.005	mg/L	0.004	0.050	0.004	0.050	0.004	0.050	0.004	0.050	CEL	CEL	CEL
4	Ammonia plus Ammonium	0.25	mg/L	0.27	2.430	0.27	2.430	0.27	2.430	0.27	2.430	CEL	CEL	CEL
4	Nitrate+Nitrite	0.25	mg/L	1.02	12.476	1.02	12.476	1.02	12.476	1.02	12.476	CEL	CEL	CEL
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	6.823	0.6	6.823	0.6	6.823	0.6	6.823	CEL	CEL	CEL
5	DOC	0.5	mg/L	4.7	54.268	4.7	54.268	4.7	54.268	4.7	54.268	CEL	CEL	CEL
5	TOC	5	mg/L	6	67.368	6	67.368	6	67.368	6	67.368	CEL	CEL	CEL
6	Total phosphorus	0.10	mg/L	0.44	5.126	0.44	5.126	0.44	5.126	0.44	5.126	CEL	CEL	CEL
8	Total suspended solids	5	mg/L	5	51.191	5	51.191	5	51.191	5	51.191	CEL	CEL	CEL
8	Volatile suspended solids	10	mg/L	5	69.179	5	69.179	5	69.179	5	69.179	CEL	CEL	CEL
9	Aluminum	30.0	ug/L	51.7	0.592	51.7	0.592	51.7	0.592	51.7	0.592	CEL	CEL	CEL
9	Copper	10.0	ug/L	5.7	0.071	5.7	0.071	5.7	0.071	5.7	0.071	CEL	CEL	CEL
9	Zinc	10.0	ug/L	9.5	0.107	9.5	0.107	9.5	0.107	9.5	0.107	CEL	CEL	CEL
10	Antimony	5.0	ug/L	35.9	0.425	35.9	0.425	35.9	0.425	35.9	0.425	CEL	CEL	CEL
11	Chromium (hexavalent)	10.0	ug/L	10.5	0.099	10.5	0.099	10.5	0.099	10.5	0.099	CEL	CEL	CEL
12	Mercury	0.10	ug/L	0.07	0.001	0.07	0.001	0.07	0.001	0.07	0.001	CEL	CEL	CEL
14	Phenolics (4AAP)	2.0	ug/L	0.8	0.009	0.8	0.009	0.8	0.009	0.8	0.009	CEL	CEL	CEL
15	Sulphide	20.0	ug/L	24.3	0.260	24.3	0.260	24.3	0.260	24.3	0.260	CEL	CEL	CEL
16	1,2-Dichloroethane	0.8	ug/L	0.7	0.008	0.7	0.008	0.7	0.008	0.7	0.008	CEL	CEL	CEL
16	Bromodichloromethane	0.8	ug/L	1.9	0.029	1.9	0.029	1.9	0.029	1.9	0.029	CEL	CEL	CEL
16	Chloroform	0.7	ug/L	1.3	0.012	1.3	0.012	1.3	0.012	1.3	0.012	CEL	CEL	CEL
16	Chloromethane	3.7	ug/L	1.5	0.018	1.5	0.018	1.5	0.018	1.5	0.018	CEL	CEL	CEL
16	Methylene chloride	1.3	ug/L	2.9	0.031	2.9	0.031	2.9	0.031	2.9	0.031	CEL	CEL	CEL
17	Benzene	0.5	ug/L	0.5	0.005	0.5	0.005	0.5	0.005	0.5	0.005	CEL	CEL	CEL
17	Toluene	0.5	ug/L	0.2	0.003	0.2	0.003	0.2	0.003	0.2	0.003	CEL	CEL	CEL
19	Biphenyl	0.6	ug/L	0.2	0.002	0.2	0.002	0.2	0.002	0.2	0.002	CEL	CEL	CEL
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.5	0.012	1.5	0.012	1.5	0.012	1.5	0.012	CEL	CEL	CEL
19	Di-n-butyl phthalate	3.8	ug/L	4.0	0.034	4.0	0.034	4.0	0.034	4.0	0.034	CEL	CEL	CEL
23	1,2,3,4-Tetrachlorobenzene	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	CEL	CEL	CEL
23	1,2,3,5-Tetrachlorobenzene	10.0	ng/L	2.1	*	2.1	*	2.1	*	2.1	*	CEL	CEL	CEL
23	1,2,3-Trichlorobenzene	10.0	ng/L	3.4	*	3.4	*	3.4	*	3.4	*	CEL	CEL	CEL
23	1,2,4-Trichlorobenzene	10.0	ng/L	5.9	*	5.9	*	5.9	*	5.9	*	CEL	CEL	CEL
23	Pentachlorobenzene	10.0	ng/L	1.1	*	1.1	*	1.1	*	1.1	*	CEL	CEL	CEL
24	Octachlorodibenzo-p-dioxin	30.0	ng/L	20.0	*	20.0	*	20.0	*	20.0	*	CEL	CEL	CEL
25	Oil and grease	1.0	mg/L	1.1	14.318	1.1	14.318	1.1	14.318	1.1	14.318	CEL	CEL	CEL

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CELANESE CANADA INC. - MILLHAVEN

CONTROL POINT - CO 0200 West Outfall to Lake
AVERAGE FLOWRATE = 36741 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	9	307.719	9	307.719	9	307.719	9	307.719	Cel	Cel	Cel
2	Cyanide Total	0.005	mg/L	0.003	0.106	0.003	0.106	0.003	0.106	0.003	0.106	Cel	Cel	Cel
4	Ammonia plus Ammonium	0.25	mg/L	0.05	1.808	0.05	1.808	0.05	1.808	0.05	1.808	Cel	Cel	Cel
4	Nitrate+Nitrite	0.25	mg/L	0.35	12.571	0.35	12.571	0.35	12.571	0.35	12.571	Cel	Cel	Cel
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	12.764	0.4	12.764	0.4	12.764	0.4	12.764	Cel	Cel	Cel
5	DOC	0.5	mg/L	2.8	92.504	2.8	92.504	2.8	92.504	2.8	92.504	Cel	Cel	Cel
5	TOC	5	mg/L	3	109.335	3	109.335	3	109.335	3	109.335	Cel	Cel	Cel
6	Total phosphorus	0.10	mg/L	0.03	0.892	0.03	0.892	0.03	0.892	0.03	0.892	Cel	Cel	Cel
8	Total suspended solids	5	mg/L	3	116.279	3	116.279	3	116.279	3	116.279	Cel	Cel	Cel
8	Volatile suspended solids	10	mg/L	3	107.594	3	107.594	3	107.594	3	107.594	Cel	Cel	Cel
9	Aluminum	30.0	ug/L	46.7	1.557	46.7	1.557	46.7	1.557	46.7	1.557	Cel	Cel	Cel
9	Copper	10.0	ug/L	13.1	0.453	13.1	0.453	13.1	0.453	13.1	0.453	Cel	Cel	Cel
9	Zinc	10.0	ug/L	21.5	0.862	21.5	0.862	21.5	0.862	21.5	0.862	Cel	Cel	Cel
10	Antimony	5.0	ug/L	1.0	0.038	1.0	0.038	1.0	0.038	1.0	0.038	Cel	Cel	Cel
11	Chromium (hexavalent)	10.0	ug/L	6.9	0.201	6.9	0.201	6.9	0.201	6.9	0.201	Cel	Cel	Cel
12	Mercury	0.10	ug/L	0.06	0.003	0.06	0.003	0.06	0.003	0.06	0.003	Cel	Cel	Cel
14	Phenolics (4AAP)	2.0	ug/L	0.9	0.031	0.9	0.031	0.9	0.031	0.9	0.031	Cel	Cel	Cel
15	Sulphide	20.0	ug/L	11.0	0.400	11.0	0.400	11.0	0.400	11.0	0.400	Cel	Cel	Cel
16	1,2-Dichloroethane	0.8	ug/L	0.7	0.025	0.7	0.025	0.7	0.025	0.7	0.025	Cel	Cel	Cel
16	Bromodichloromethane	0.8	ug/L	0.3	0.010	0.3	0.010	0.3	0.010	0.3	0.010	Cel	Cel	Cel
16	Chloroform	0.7	ug/L	1.1	0.031	1.1	0.031	1.1	0.031	1.1	0.031	Cel	Cel	Cel
16	Chloromethane	3.7	ug/L	1.2	0.049	1.2	0.049	1.2	0.049	1.2	0.049	Cel	Cel	Cel
16	Methylene chloride	1.3	ug/L	2.2	0.092	2.2	0.092	2.2	0.092	2.2	0.092	Cel	Cel	Cel
17	Benzene	0.5	ug/L	1.3	0.038	1.3	0.038	1.3	0.038	1.3	0.038	Cel	Cel	Cel
17	Toluene	0.5	ug/L	0.3	0.010	0.3	0.010	0.3	0.010	0.3	0.010	Cel	Cel	Cel
19	Biphenyl	0.6	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	Cel	Cel	Cel
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.3	0.011	0.3	0.011	0.3	0.011	0.3	0.011	Cel	Cel	Cel
19	Di-n-butyl phthalate	3.8	ug/L	10.6	0.253	10.6	0.253	10.6	0.253	10.6	0.253	Cel	Cel	Cel
23	1,2,3,4-Tetrachlorobenzene	10.0	ng/L	1.2	*	1.2	*	1.2	*	1.2	*	Cel	Cel	Cel
23	1,2,3,5-Tetrachlorobenzene	10.0	ng/L	2.1	*	2.1	*	2.1	*	2.1	*	Cel	Cel	Cel
23	1,2,3-Trichlorobenzene	10.0	ng/L	3.2	*	3.2	*	3.2	*	3.2	*	Cel	Cel	Cel
23	1,2,4-Trichlorobenzene	10.0	ng/L	7.5	*	7.5	*	7.5	*	7.5	*	Cel	Cel	Cel
23	Pentachlorobenzene	10.0	ng/L	1.1	*	1.1	*	1.1	*	1.1	*	Cel	Cel	Cel
24	Octachlorodibenzo-p-dioxin	30.0	ng/L	20.3	*	20.3	*	20.3	*	20.3	*	Cel	Cel	Cel
25	Oil and grease	1.0	mg/L	1.1	38.204	1.1	38.204	1.1	38.204	1.1	38.204	Cel	Cel	Cel

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CELANESE CANADA INC. - MILLHAVEN

CONTROL POINT - CO 0300 East Outfall to Lake
AVERAGE FLOWRATE = 27042 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV'RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	9	224.347	9	224.347	9	224.347	9	224.347	Cel	Cel	Cel
2	Cyanide Total	0.005	mg/L	0.003	0.081	0.003	0.081	0.003	0.081	0.003	0.081	Cel	Cel	Cel
4	Ammonia plus Ammonium	0.25	mg/L	0.05	1.607	0.05	1.607	0.05	1.607	0.05	1.607	Cel	Cel	Cel
4	Nitrate+Nitrite	0.25	mg/L	0.34	10.458	0.34	10.458	0.34	10.458	0.34	10.458	Cel	Cel	Cel
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	9.264	0.3	9.264	0.3	9.264	0.3	9.264	Cel	Cel	Cel
5	DOC	0.5	mg/L	2.4	62.644	2.4	62.644	2.4	62.644	2.4	62.644	Cel	Cel	Cel
5	TOC	5	mg/L	3	92.822	3	92.822	3	92.822	3	92.822	Cel	Cel	Cel
6	Total phosphorus	0.10	mg/L	0.05	1.218	0.05	1.218	0.05	1.218	0.05	1.218	Cel	Cel	Cel
8	Total suspended solids	5	mg/L	2	65.144	2	65.144	2	65.144	2	65.144	Cel	Cel	Cel
8	Volatile suspended solids	10	mg/L	3	89.374	3	89.374	3	89.374	3	89.374	Cel	Cel	Cel
9	Aluminum	30.0	ug/L	53.3	1.095	53.3	1.095	53.3	1.095	53.3	1.095	Cel	Cel	Cel
9	Copper	10.0	ug/L	5.6	0.131	5.6	0.131	5.6	0.131	5.6	0.131	Cel	Cel	Cel
9	Zinc	10.0	ug/L	13.9	0.246	13.9	0.246	13.9	0.246	13.9	0.246	Cel	Cel	Cel
10	Antimony	5.0	ug/L	5.0	0.179	5.0	0.179	5.0	0.179	5.0	0.179	Cel	Cel	Cel
11	Chromium (hexavalent)	10.0	ug/L	6.1	0.130	6.1	0.130	6.1	0.130	6.1	0.130	Cel	Cel	Cel
12	Mercury	0.10	ug/L	0.06	0.001	0.06	0.001	0.06	0.001	0.06	0.001	Cel	Cel	Cel
14	Phenolics (4AAP)	2.0	ug/L	1.4	0.035	1.4	0.035	1.4	0.035	1.4	0.035	Cel	Cel	Cel
15	Sulphide	20.0	ug/L	20.3	0.578	20.3	0.578	20.3	0.578	20.3	0.578	Cel	Cel	Cel
16	1,2-Dichloroethane	0.8	ug/L	0.7	0.018	0.7	0.018	0.7	0.018	0.7	0.018	Cel	Cel	Cel
16	Bromodichloromethane	0.8	ug/L	0.3	0.011	0.3	0.011	0.3	0.011	0.3	0.011	Cel	Cel	Cel
16	Chloroform	0.7	ug/L	1.7	0.044	1.7	0.044	1.7	0.044	1.7	0.044	Cel	Cel	Cel
16	Chloromethane	3.7	ug/L	1.7	0.017	1.7	0.017	1.7	0.017	1.7	0.017	Cel	Cel	Cel
16	Methylene chloride	1.3	ug/L	2.5	0.052	2.5	0.052	2.5	0.052	2.5	0.052	Cel	Cel	Cel
17	Benzene	0.5	ug/L	0.5	0.014	0.5	0.014	0.5	0.014	0.5	0.014	Cel	Cel	Cel
17	Toluene	0.5	ug/L	0.3	0.008	0.3	0.008	0.3	0.008	0.3	0.008	Cel	Cel	Cel
19	Biphenyl	0.6	ug/L	1.1	0.027	1.1	0.027	1.1	0.027	1.1	0.027	Cel	Cel	Cel
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	3.4	0.100	3.4	0.100	3.4	0.100	3.4	0.100	Cel	Cel	Cel
19	Di-n-butyl phthalate	3.8	ug/L	4.4	0.128	4.4	0.128	4.4	0.128	4.4	0.128	Cel	Cel	Cel
23	1,2,3,4-Tetrachlorobenzene	10.0	ng/L	1.2	*	1.2	*	1.2	*	1.2	*	Cel	Cel	Cel
23	1,2,3,5-Tetrachlorobenzene	10.0	ng/L	2.1	*	2.1	*	2.1	*	2.1	*	Cel	Cel	Cel
23	1,2,3-Trichlorobenzene	10.0	ng/L	3.2	*	3.2	*	3.2	*	3.2	*	Cel	Cel	Cel
23	1,2,4-Trichlorobenzene	10.0	ng/L	1.8	*	1.8	*	1.8	*	1.8	*	Cel	Cel	Cel
23	Pentachlorobenzene	10.0	ng/L	1.1	*	1.1	*	1.1	*	1.1	*	Cel	Cel	Cel
24	Octachlorodibenzo-p-dioxin	30.0	ng/L	20.3	*	20.3	*	20.3	*	20.3	*	Cel	Cel	Cel
25	Oil and grease	1.0	mg/L	1.1	28.136	1.1	28.136	1.1	28.136	1.1	28.136	Cel	Cel	Cel

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

CHINOOK GROUP - SOMBRA PLANT

1.0 PLANT DESCRIPTION

The Chinook plant is situated south of Sarnia in Sombra about 1 km east of the St. Clair River.

The following chemicals are produced by the plant:

- monomethylamine, a chemical intermediate used in the tanning and dye, insecticide, fungicide and explosives industries. It is sold as a liquified gas.
- dimethylamine, a chemical intermediate used in the textile and rubber industries and in the manufacture of dimethylformanide and dimethylacetamide; it is sold as a liquified gas.
- trimethylamine, a chemical intermediate used in the manufacture of choline chloride and other quaternary ammonium compounds; it is sold as a liquified gas.
- dimethylformamide, a solvent.
- choline chloride, used as a poultry feed additive.

Water for use at the plant is pumped from the river. The water is used mainly for make-up of a recirculating cooling system with blowdown from this system being the main plant discharge (MISA Control Point CO 0100). Some contaminated contact effluent from storm water drains under the process area is held in a pond and then used for partial cooling make-up or for seasonal landfarm irrigation. Drainage from the landfarm takes place mainly during storm events. All other wastes are trucked for disposal when required.

Details on the plant production processes, water uses, and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

There are three types of sewers in the plant:

- A combined storm and process sewer that discharges to the holdup pond.

- A process sewer that collects boiler blowdown, cooling tower blowdown, and sand filter backwash. This stream discharges directly to the St. Clair River through MISA Control Point CO 0100 without treatment.

- A sanitary sewer that discharges to a separate septic tank system and tile bed located in the front lawn.

Table 1.0 presents a summary of plant generated wastewater and its destinations.

TABLE 1.0
CHINOOK GROUP - SOURCES OF WASTEWATER

SOURCE	DESTINATION
Boiler blowdown	Outfall CO 0100
Cooling tower blowdown	Outfall CO 0100
Sand filter backwash	Outfall CO 0100
Condensate from steam traps	Holdup pond
Vacuum steam jets	Holdup pond
Storm water run-off (inc. spray field run-off)	Holdup pond
Laboratory wastes	Outside contractor
Sanitary wastes	Separate septic tank system

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results for MISA Control Point CO 0100 as obtained from the MISA OCM Sector Twelve Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT and Maximum Reduction Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best

technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period were determined to be acutely lethal to both Daphnia Magna and Rainbow Trout.

A review of the matching analytical chemistry monitoring data on the days the effluent was lethal did not reveal any high concentrations of contaminants. An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity Unit indicated that the causes of toxicity were not conclusive and additional data will be needed before an assessment can be made (Ref. 2).

Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Point CO 0100 to assess the toxicity problems identified. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 3).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies found at similar U.S. or Ontario organic chemical manufacturing plants that, if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report showed that the plant effluent (MISA Control Point CO 0100) contained elevated concentrations of conventional pollutants. These included elevated concentrations of COD (453 mg/l), DOC (77.0 mg/l), and TOC (135 mg/l). Biological treatment (activated sludge followed by secondary clarification) has been proven to be a demonstrated technology for the removal of these contaminants in similar USA and Ontario organic manufacturing plants. Polysar's biological treatment effluent (Polysar MISA Control Point PR 1800) achieved the following effluent concentrations during the MISA Twelve Month Monitoring Period: DOC

(16.7 mg/l), TOC (15 mg/l), and COD (69 mg/l). Therefore, biological treatment is recommended for BAT Option 2.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would provide the plant furthest toward zero discharge and virtual elimination of contaminants and consists of any current technology or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors. Based on the contaminant levels present in the effluent after implementation of BAT Option 2, multi-media filtration and granular activated carbon are recommended to further control COD, DOC and TOC and to reduce the concentrations of other organics and metals. It should be noted that the technologies recommended for BAT Option 3 are in addition of the technologies already recommended under BAT Option 1 and 2.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for this plant.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR CHINOOK GROUP

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-Lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/ Maximum Pollutant Reduction	Biological treatment (activated sludge and secondary clarification)
3	Zero Discharge/Virtual Elimination	Option 2 plus granular activated carbon followed by multimedia filtration.

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of effluent concentration data for the remaining BAT options is included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation, was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste- specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Chinook Group Ltd. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 4).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for Chinook Group, Ltd. The only cost estimates are for biological treatment (activated sludge and secondary clarification), granular activated carbon and multi-media filtration at CO 0100. Cost estimates for development and implementation of a TIE study could not be developed due to the site-specific nature of the study.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 2			BAT OPTION 3		
		CAPITAL COST	O&M	TECHNOLOGY	CAPITAL COST	O&M	TECHNOLOGY
CO 0100	205	657,100*	74,100*	Activated Sludge/Secondary Clarifier	657,100	74,100	Option 2
					454,400	260,900	GAC
					438,400	40,200	FIL
					1,549,900	375,200	TOTAL

NOTES:

* Includes cost for sludge handling and disposal
GAC - Granular Activated Carbon
FIL - Multi-media Filtration

6.0 REFERENCES

1. Chinook Group Ltd. - BAT Status of the OCM Sector Plants Site Visit Information Report, April 9, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirier, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fiber Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR CHINOOK GROUP, LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – CHINOOK GROUP LTD. – SOMBRA

ATG	PARAMETER	RMDL	UNIT	IN 0400	CO 0100
1	COD	10	mg/L	8	453
2	Cyanide Total	0.005	mg/L	0.002	0.003
3	Hydrogen ion (pH)			8.3	8.3
4	Ammonia plus Ammonium	0.25	mg/L	0.04	1.63
4	Nitrate+Nitrite	0.25	mg/L	0.47	1.00
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	17.8
5	DOC	0.5	mg/L	2.1	77.0
5	TOC	5	mg/L	–	135
6	Total phosphorus	0.10	mg/L	0.06	4.36
7	Specific conductance	5	uS/cm	257	961
8	Total suspended solids	5	mg/L	1	15
8	Volatile suspended solids	10	mg/L	1	10
9	Aluminum	30.0	ug/L	251.5	282.4
9	Chromium	20.0	ug/L	2.0	93.5
9	Copper	10.0	ug/L	80.0	8.5
9	Zinc	10.0	ug/L	20.4	137.5
10	Arsenic	5.0	ug/L	0.8	4.9
11	Chromium (hexavalent)	10.0	ug/L	–	21.2
15	Sulphide	20.0	ug/L	10.0	35.0
16	Bromodichloromethane	0.8	ug/L	0.9	0.9
16	Chloroform	0.7	ug/L	0.5	2.5
16	Chloromethane	3.7	ug/L	4.2	4.5
16	Methylene chloride	1.3	ug/L	272.2	270.7
17	Benzene	0.5	ug/L	0.7	0.5
19	Benzylbutylphthalate	0.6	ug/L	1.0	0.6
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	7.1	2.6
19	Diphenyl ether	0.4	ug/L	1.1	1.1
23	1,2,4–Trichlorobenzene	10.0	ng/L	10.0	10.0
23	Hexachlorobutadiene	10.0	ng/L	20.0	10.0
24	Total TCDD	20.0	pg/L	20.0	50.0
24	Total PCDD	20.0	pg/L	20.0	60.0
24	Total H6CDD	30.0	pg/L	20.0	40.5
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	30.0	53.5
25	Oil and grease	1.0	mg/L	0.9	1.6
27	PCBT	0.1	ug/L	0.1	0.2
98	Ftflow		m3/day		134

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0400 – Intake Water to Site

CO 0100 – Sump Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – CHINOOK GROUP LTD. – SOMBRA

ATG	PARAMETER	IN 0400	CO 0100	TOTAL
1	COD	1.232	77.172	77.172
2	Cyanide Total	*	0.001	0.001
4	Ammonia plus Ammonium	0.006	0.173	0.173
4	Nitrate+Nitrite	0.077	0.125	0.125
4	Total Kjeldahl Nitrogen	0.059	2.394	2.394
5	DOC	0.339	11.001	11.001
5	TOC	–	16.797	16.797
6	Total phosphorus	0.009	0.456	0.456
8	Total suspended solids	0.209	1.772	1.772
8	Volatile suspended solids	0.187	1.738	1.738
9	Aluminum	0.043	0.040	0.040
9	Chromium	*	0.007	0.007
9	Copper	0.014	0.001	0.001
9	Zinc	0.003	0.009	0.009
10	Arsenic	*	0.001	0.001
11	Chromium (hexavalent)	–	0.001	0.001
15	Sulphide	0.002	0.005	0.005
16	Bromodichloromethane	*	*	*
16	Chloroform	*	0.001	0.001
16	Chloromethane	0.001	0.001	0.001
16	Methylene chloride	0.036	0.036	0.036
17	Benzene	*	*	*
19	Benzylbutylphthalate	*	*	*
19	Bis(2–ethylhexyl) phthalate	0.001	*	*
19	Diphenyl ether	*	*	*
23	1,2,4–Trichlorobenzene	*	*	*
23	Hexachlorobutadiene	*	*	*
24	Total TCDD	*	*	*
24	Total PCDD	*	*	*
24	Total H6CDD	*	*	*
24	Octachlorodibenzo–p–dioxin	*	*	*
25	Oil and grease	0.155	0.181	0.181
27	PCBT	*	*	*

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0400 – Intake Water to Site
CO 0100 – Sump Effluent to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
CHINOOK GROUP, LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CHINOOK GROUP LTD. - SOMBRA

CONTROL POINT - CO 0100 Sump Effluent to River
AVERAGE FLOWRATE = 134 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	453	77.172	453	77.172	69	9.246	31	4.154	Chin	Poly	Esso
2	Cyanide Total	0.005	mg/L	0.003	0.001	0.003	0.001	0.003	0.001	0.003	0.001	Chin	Chin	Chin
4	Ammonia plus Ammonium	0.25	mg/L	1.63	0.173	1.63	0.173	1.63	0.173	1.63	0.173	Chin	Chin	Chin
4	Nitrate+Nitrite	0.25	mg/L	1.00	0.125	1.00	0.125	1.00	0.125	1.00	0.125	Chin	Chin	Chin
4	Total Kjeldahl Nitrogen	0.5	mg/L	17.8	2.394	17.8	2.394	2.3	0.308	2.3	0.308	Chin	Poly	Poly
5	DOC	0.5	mg/L	77.0	11.001	77.0	11.001	16.7	2.238	4.4	0.590	Chin	Poly	Esso
5	TOC	5	mg/L	135	16.797	135	16.797	15	2.010	5	0.670	Chin	Poly	Esso
6	Total phosphorus	0.10	mg/L	4.36	0.456	4.36	0.456	0.71	0.095	0.71	0.095	Chin	Poly	Poly
8	Total suspended solids	5	mg/L	15	1.772	15	1.772	15	1.772	5	0.670	Chin	Chin	P1774
8	Volatile suspended solids	10	mg/L	10	1.738	10	1.738	10	1.738	5	0.670	Chin	Chin	P1774
9	Aluminum	30.0	ug/L	282.4	0.040	282.4	0.040	282.4	0.040	47.0	0.006	Chin	Chin	RREL
9	Chromium	20.0	ug/L	93.5	0.007	93.5	0.007	93.5	0.007	17.0	0.002	Chin	Chin	RREL
9	Copper	10.0	ug/L	8.5	0.001	8.5	0.001	8.5	0.001	8.5	0.001	Chin	Chin	Chin
9	Zinc	10.0	ug/L	137.5	0.009	137.5	0.009	137.5	0.009	42.0	0.006	Chin	Chin	RREL
10	Arsenic	5.0	ug/L	4.9	0.001	4.9	0.001	4.9	0.001	4.9	0.001	Chin	Chin	Chin
11	Chromium (hexavalent)	10.0	ug/L	21.2	0.001	21.2	0.001	21.2	0.001	21.2	0.001	Chin	Chin	Chin
15	Sulphide	20.0	ug/L	35.0	0.005	35.0	0.005	35.0	0.005	35.0	0.005	Chin	Chin	Chin
16	Bromodichloromethane	0.8	ug/L	0.9	*	0.9	*	0.9	*	0.4	*	Chin	Chin	Esso
16	Chloroform	0.7	ug/L	2.5	0.001	2.5	0.001	2.5	0.001	1.2	*	Chin	Chin	Esso
16	Chloromethane	3.7	ug/L	4.5	0.001	4.5	0.001	4.5	0.001	4.5	0.001	Chin	Chin	Chin
16	Methylene chloride	1.3	ug/L	270.7	0.036	270.7	0.036	270.7	0.036	270.7	0.036	Chin	Chin	Chin
17	Benzene	0.5	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	Chin	Chin	Chin
19	Benzylbutylphthalate	0.6	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Chin	Chin	Chin
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.6	*	2.6	*	2.6	*	2.6	*	Chin	Chin	Chin
19	Diphenyl ether	0.4	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	Chin	Chin	Chin
23	1,2,4-Trichlorobenzene	10.0	ng/L	10.0	*	10.0	*	10.0	*	10.0	*	Chin	Chin	Chin
23	Hexachlorobutadiene	10.0	ng/L	10.0	*	10.0	*	10.0	*	10.0	*	Chin	Chin	Chin
24	Total TCDD	20.0	pg/L	50.0	*	50.0	*	50.0	*	50.0	*	Chin	Chin	Chin
24	Total PCDD	20.0	pg/L	60.0	*	60.0	*	60.0	*	60.0	*	Chin	Chin	Chin
24	Total H6CDD	30.0	pg/L	40.5	*	40.5	*	40.5	*	40.5	*	Chin	Chin	Chin
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	53.5	*	53.5	*	53.5	*	53.5	*	Chin	Chin	Chin
25	Oil and grease	1.0	mg/L	1.6	0.181	1.6	0.181	1.6	0.181	1.6	0.181	Chin	Chin	Chin
27	PCBT	0.1	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	Chin	Chin	Chin

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

CORNWALL CHEMICALS LTD.

1.0 PLANT DESCRIPTION

Cornwall Chemicals Ltd. is located at Second Street West and Brookdale Avenue in Cornwall and occupies the same site as ICI Forest Products and the Conpak Facilities of Stanchem. Cornwall produces carbon disulphide (CS_2) and carbon tetrachloride (CTC), which are sold as feedstocks to other industries.

Cooling water is supplied from two cooling towers, so the plant discharge consists mostly of various scrubber effluents, condensates, wash waters, CS_2 moat water and cooling tower blowdowns. The effluent from the CS_2 plant and the CTC operation are combined prior to discharge in a common sewer at MISA Control Point PR 0100, which is located at Manhole Number 26.

Existing wastewater treatment at the Cornwall Chemicals Ltd. Plant is limited to steam stripping of the CS_2 plant effluent (for CS_2 recovery) and settling and neutralization of the combined CS_2 and CTC plant effluents.

Details on the plant processes, water uses, wastewater generation, and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

As indicated, all plant effluents are combined prior to discharge in a common sewer at MISA Control Point PR 0100. The process sewer at Cornwall collects all process effluents, stormwater and washwater as well as most spills that may occur at the plant. Most of the process sewer is an open trench.

Wastes from the CS_2 plant discharge to a trench which ends at the CS_2 effluent pit. The effluent pit discharges to the CTC Plant discharge trench. Cooling tower blowdown, boiler blowdown, and effluent pit overflows discharge directly to the main sewer.

The CTC effluent discharges to the discharge trench which leads to three settling sumps. The discharge from the final sump joins the main effluent sewer. The cooling tower blowdown from the CTC plant discharges directly to the main sewer.

There is no effective separation of wastestreams or storm runoff.

Table 1.0 presents a summary of the wastewater generated at the plant.

Table 1.0
Wastewater Sources at Cornwall Chemicals

Source	Type	Destination
CS_2 Plant		
Caustic water stripper	Stripper water	CS_2 effluent pit
Caustic wash	Wash water	CS_2 effluent pit
CS_2 tanks	Press water	CS_2 effluent pit
Furnace coil pump	Seal water	CS_2 effluent pit
Furnace	Blowdown quench water	CS_2 effluent pit
CS_2 check tanks	Press water	CS_2 effluent pit
CS_2 cooling tower	Blowdown	Sewer to MH 26
Boiler	Blowdown	Sewer to MH 26
Floor drains	Wash water	CS_2 effluent pit
Water softener	Back flush	Sanitary sewer
Paved areas	Storm water	CS_2 effluent pit
CTC Plant		
Sulphur pots	Scrubber water	Discharge trench
CL^2 vaporizer	Condensate	Discharge trench
CS_2 check tank	Press water	Discharge trench
CS_2 storage tanks	Press water	Discharge trench
MTC scrubber	Scrubber water	Discharge trench
Vent condenser	Cooling water	Vent gas scrubber
Vent gas scrubber	Scrubbing water	Discharge trench
Second decanter (RB 612)	Water	Discharge trench
First decanter (D603/T603)	Water	Discharge trench
Neutralizer	Water	Discharge trench
Floor drains	Wash water	Discharge trench
Lab sink	Wash water	Discharge trench
Paved areas	Storm water	Discharge trench
Cooling tower	Blowdown	Sewer to MH 26
Transite stack	Water	Discharge trench

2.2 WASTEWATER QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point PR 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options is addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed the plant effluent to be acutely lethal to both Daphnia Magna and Rainbow Trout.

A review of the matching analytical chemistry monitoring data on the days the effluent was lethal revealed high concentrations of sulphides and carbon tetrachloride. Sulphide and carbon tetrachloride concentrations reached as high as 15 ppm and 20 ppm, respectively. An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity Unit indicated that sulphide and carbon tetrachloride concentrations in the effluent contributed to the observed lethality (Ref. 2).

Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Point PR 0100 to assess the toxicity problems identified. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 3).

In addition, it is recommended that a steam stripper be installed on the combined CTC discharge trench and the CS_2 effluents to remove carbon tetrachloride and sulphides, respectively. It was determined that upgrading of the existing CS_2 stripper to remove sulphides would be difficult since the main purpose of the existing stripper is the recovery and reuse of CS_2 not reduction of contaminants from the effluent. It should also be noted that for actual implementation of this option, it may be appropriate to install separate

steam strippers on the CTC and CS_2 process wastestreams to avoid operational difficulties and to enhance the possibility of recycling the recovered materials.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies found at similar U.S. or Ontario organic chemical manufacturing plants that, if installed, will achieve the maximum overall pollutant reduction. With the reduction of carbon tetrachloride and sulfide effluent concentrations that are expected to be achieved with the installation of the technologies recommended for BAT Option 1, the plant's pollutant discharge levels will be as low or lower than discharge levels for similar U.S. and Ontario plants. Therefore, BAT Option 2 is recommended to be equal to BAT Option 1.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and zero discharge of contaminants and consists of any current technology or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors. Based on the pollutant concentrations in the effluent after implementation of BAT Option 1/2, granular activated carbon and multi-media filtration are recommended to further control various volatile organic compounds (VOCs) and to reduce concentrations of DOC, TOC and COD as well as other organics and metals.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for this plant.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR CORNWALL CHEMICALS LTD.

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-Lethal effluent	Steam stripping for CTC discharge trench effluent and the CS_2 effluent.
2	USA/Ontario BAT/Maximum Pollutant Reduction	Same as Option 1
3	Zero Discharge/Virtual Elimination	Option 2 plus granular activated carbon and multi-media filtration for MISA Control Point PR 0100.

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 COST ESTIMATES OF SELECTED BAT OPTION MODELS

This section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation, was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for the Cornwall Chemicals Ltd. plant were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 3).

Table 3.0 presents the cost estimates developed for the technologies considered for each BAT option for MISA Control Point PR 0100 at Cornwall Chemical Ltd. Cost estimates developed include steam stripping, multi-media filtration and granular activated carbon. Cost estimates for development and implementation of a TIE Study could not be developed due to the site-specific nature of the study.

TABLE 4.0
BAT OPTION MODELS COST ESTIMATES

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
PR 0100	822	1,132,100	337,100	SS	1,132,100	337,100	SS	1,132,100	337,100	Option 2
								1,295,800	948,600	GAC
								575,100	57,500	FIL
								3,003,000	1,343,200	TOTAL

NOTES:

SS - Steam Stripping
GAC - Granular Activated Carbon
FIL - Multimedia Filtration

6.0 REFERENCES

1. Comwall Chemicals Ltd - BAT Status of the OCM Sector Plants Site Visit Information Report, March 22, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirier, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fiber Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR CORNWALL CHEMICALS LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – CORNWALL CHEMICALS LTD. – CORNWALL

ATG	PARAMETER	RMDL	UNIT	IN 0300	PR 0100
1	COD	10	mg/L	5	98
2	Cyanide Total	0.005	mg/L	–	0.003
3	Hydrogen ion (pH)			7.9	6.5
4	Ammonia plus Ammonium	0.25	mg/L	0.15	0.31
4	Nitrate+Nitrite	0.25	mg/L	0.27	0.19
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	1.0
5	DOC	0.5	mg/L	3.2	5.9
5	TOC	5	mg/L	–	7
6	Total phosphorus	0.10	mg/L	0.04	0.17
7	Specific conductance	5	uS/cm	229	1744
8	Total suspended solids	5	mg/L	5	19
8	Volatile suspended solids	10	mg/L	–	11
9	Aluminum	30.0	ug/L	73.0	381.8
9	Beryllium	10.0	ug/L	12.2	3.3
9	Boron	50.0	ug/L	–	105.9
9	Cadmium	2.0	ug/L	9.0	0.9
9	Copper	10.0	ug/L	17.1	16.8
9	Molybdenum	20.0	ug/L	31.8	18.8
9	Nickel	20.0	ug/L	13.1	166.1
9	Thallium	30.0	ug/L	33.0	13.4
9	Vanadium	30.0	ug/L	67.0	17.8
9	Zinc	10.0	ug/L	14.3	117.8
11	Chromium (hexavalent)	10.0	ug/L	–	5.0
12	Mercury	0.10	ug/L	0.33	3.06
14	Phenolics (4AAP)	2.0	ug/L	2.4	1.0
15	Sulphide	20.0	ug/L	13.6	5304.1
16	Bromodichloromethane	0.8	ug/L	3.5	2.6
16	Carbon tetrachloride	1.3	ug/L	0.4	16877.4
16	Chloroform	0.7	ug/L	8.6	89.4
16	Chloromethane	3.7	ug/L	1.1	73.8
16	Methylene chloride	1.3	ug/L	0.7	5.9
16	Tetrachloroethylene	1.1	ug/L	0.4	1.2
16	Trichloroethylene	1.9	ug/L	0.4	2.2
23	1,2,3–Trichlorobenzene	10.0	ng/L	12.0	11.2
23	Hexachlorobenzene	10.0	ng/L	3.7	41.6
23	Hexachlorobutadiene	10.0	ng/L	5.4	44.1
23	Hexachlorocyclopentadiene	10.0	ng/L	17.0	12.6
23	Hexachloroethane	10.0	ng/L	3.9	542.4
24	Total H7CDD	30.0	ng/L	–	88.0
24	Total H7CDF	30.0	ng/L	–	42.0
24	Octachlorodibenzo–p–dioxin	30.0	ng/L	–	160.0
25	Oil and grease	1.0	mg/L	0.9	4.7
98	Ftflow		m3/day	–	655

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation

(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS

IN 0300 – Intake Water to Site

PR 0100 – Manhole 26 Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – CORNWALL CHEMICALS LTD. – CORNWALL

ATG	PARAMETER	IN 0300	PR 0100	TOTAL
1	COD	3.250	58.465	58.465
2	Cyanide Total	–	0.002	0.002
4	Ammonia plus Ammonium	0.101	0.168	0.168
4	Nitrate+Nitrite	0.188	0.096	0.096
4	Total Kjeldahl Nitrogen	0.264	0.534	0.534
5	DOC	2.175	3.885	3.885
5	TOC	–	4.744	4.744
6	Total phosphorus	0.024	0.106	0.106
8	Total suspended solids	3.204	11.947	11.947
8	Volatile suspended solids	–	5.758	5.758
9	Aluminum	0.049	0.225	0.225
9	Beryllium	0.008	0.002	0.002
9	Boron	–	0.070	0.070
9	Cadmium	0.006	0.001	0.001
9	Copper	0.011	0.010	0.010
9	Molybdenum	0.020	0.012	0.012
9	Nickel	0.008	0.088	0.088
9	Thallium	0.021	0.008	0.008
9	Vanadium	0.040	0.010	0.010
9	Zinc	0.009	0.080	0.080
11	Chromium (hexavalent)	–	0.003	0.003
12	Mercury	*	0.002	0.002
14	Phenolics (4AAP)	0.002	*	*
15	Sulphide	0.008	3.564	3.564
16	Bromodichloromethane	0.002	0.002	0.002
16	Carbon tetrachloride	*	11.361	11.361
16	Chloroform	0.005	0.056	0.056
16	Chloromethane	0.001	0.046	0.046
16	Methylene chloride	*	0.004	0.004
16	Tetrachloroethylene	*	0.001	0.001
16	Trichloroethylene	*	0.001	0.001
23	1,2,3–Trichlorobenzene	*	*	*
23	Hexachlorobenzene	*	*	*
23	Hexachlorobutadiene	*	*	*
23	Hexachlorocyclopentadiene	*	*	*
23	Hexachloroethane	*	*	*
24	Total H7CDD	–	*	*
24	Total H7CDF	–	*	*
24	Octachlorodibenzo–p–dioxin	–	*	*
25	Oil and grease	0.581	3.196	3.196

EXPLANATORY NOTES:
(i) "–" not required by the regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0300 – Intake Water to Site
PR 0100 – Manhole 26 Effluent to River

APPENDIX B

PERFORMANCE DATA OF SELECTED BAT OPTIONS
CORNWALL CHEMICALS LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - CORNWALL CHEMICALS LTD - CORNWALL

PR 0100 - Manhole 26 Effluent to River
AVERAGE FLOWRATE = 655 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	98	58.465	98	58.465	98	58.465	31	20.305	Corn	Corn	Esso
4	Ammonia plus Ammonium	0.25	mg/L	0.31	0.168	0.31	0.168	0.31	0.168	0.31	0.168	Corn	Corn	Corn
4	Nitrate+Nitrite	0.25	mg/L	0.19	0.096	0.19	0.096	0.19	0.096	0.19	0.096	Corn	Corn	Corn
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.0	0.534	1.0	0.534	1.0	0.534	1.0	0.534	Corn	Corn	Corn
5	DOC	0.5	mg/L	5.9	3.885	5.9	3.885	5.9	3.885	4.4	2.882	Corn	Corn	Esso
5	TOC	5	mg/L	7	4.744	7	4.744	7	4.744	5	3.275	Corn	Corn	Esso
6	Total phosphorus	0.10	mg/L	0.17	0.106	0.17	0.106	0.17	0.106	0.17	0.106	Corn	Corn	Corn
8	Total suspended solids	5	mg/L	19	11.947	19	11.947	19	11.947	5	3.275	Corn	Corn	P1774
8	Volatile suspended solids	10	mg/L	11	5.758	11	5.758	11	5.758	5	3.275	Corn	Corn	P1774
9	Aluminum	30.0	ug/L	381.8	0.225	381.8	0.225	381.8	0.225	47.0	0.031	Corn	Corn	RREL
9	Beryllium	10.0	ug/L	3.3	0.002	3.3	0.002	3.3	0.002	3.3	0.002	Corn	Corn	Corn
9	Boron	50.0	ug/L	105.9	0.070	105.9	0.070	105.9	0.070	105.9	0.070	Corn	Corn	Corn
9	Cadmium	2.0	ug/L	0.9	0.001	0.9	0.001	0.9	0.001	0.9	0.001	Corn	Corn	Corn
9	Copper	10.0	ug/L	16.8	0.010	16.8	0.010	16.8	0.010	16.8	0.010	Corn	Corn	Corn
9	Molybdenum	20.0	ug/L	18.8	0.012	18.8	0.012	18.8	0.012	18.8	0.012	Corn	Corn	Corn
9	Nickel	20.0	ug/L	166.1	0.088	166.1	0.088	166.1	0.088	166.1	0.088	Corn	Corn	Corn
9	Thallium	30.0	ug/L	13.4	0.008	13.4	0.008	13.4	0.008	13.4	0.008	Corn	Corn	Corn
9	Vanadium	30.0	ug/L	17.8	0.010	17.8	0.010	17.8	0.010	17.8	0.010	Corn	Corn	Corn
9	Zinc	10.0	ug/L	117.8	0.080	117.8	0.080	117.8	0.080	42.0	0.028	Corn	Corn	RREL
11	Chromium (hexavalent)	10.0	ug/L	5.0	0.003	5.0	0.003	5.0	0.003	5.0	0.003	Corn	Corn	Corn
12	Mercury	0.10	ug/L	3.06	0.002	3.06	0.002	3.06	0.002	3.06	0.002	Corn	Corn	Corn
14	Phenolics (4AAP)	2.0	ug/L	1.0	*	1.0	*	1.0	*	1.0	*	Corn	Corn	Corn
15	Sulphide	20.0	ug/L	5304.1	3.564	200.0	0.131	200.0	0.131	200.0	0.131	PetRef	PetRef	PetRef
16	Bromodichloromethane	0.8	ug/L	2.6	0.002	2.6	0.002	2.6	0.002	0.4	*	Corn	Corn	Esso
16	Carbon tetrachloride	1.3	ug/L	16877.4	11.361	7.0	0.005	7.0	0.005	7.0	0.005	RREL	RREL	RREL
16	Chloroform	0.7	ug/L	89.4	0.056	ND(10)	0.007	ND(10)	0.007	3.0	0.002	415P	415P	Esso
16	Chloromethane	3.7	ug/L	73.8	0.046	ND(50)	0.033	ND(50)	0.033	ND(50)	0.033	725T	725T	725T
16	Methylene chloride	1.3	ug/L	5.9	0.004	5.9	0.004	5.9	0.004	5.9	0.004	Corn	Corn	Corn
16	Tetrachloroethylene	1.1	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	Corn	Corn	Corn
16	Trichloroethylene	1.9	ug/L	2.2	0.001	2.2	0.001	2.2	0.001	2.2	0.001	Corn	Corn	Corn
23	1,2,3-Trichlorobenzene	10.0	ng/L	11.2	*	11.2	*	11.2	*	11.2	*	Corn	Corn	Corn
23	Hexachlorobenzene	10.0	ng/L	41.6	*	41.6	*	41.6	*	41.6	*	Corn	Corn	Corn
23	Hexachlorobutadiene	10.0	ng/L	44.1	*	44.1	*	44.1	*	44.1	*	Corn	Corn	Corn
23	Hexachlorocyclopentadiene	10.0	ng/L	12.6	*	12.6	*	12.6	*	12.6	*	Corn	Corn	Corn
23	Hexachloroethane	10.0	ng/L	542.4	*	542.4	*	542.4	*	72.8	*	Corn	Corn	Esso
24	Total H7CDD	30.0	pg/L	88	*	88	*	88	*	88	*	Corn	Corn	Corn
24	Total H7CDF	30.0	pg/L	42	*	42	*	42	*	42	*	Corn	Corn	Corn
24	Total O8CDD	30.0	pg/L	160	*	160	*	160	*	35	*	Corn	Corn	Esso
25	Oil and grease	1.0	mg/L	4.7	3.196	4.7	3.196	4.7	3.196	4.7	3.196	Corn	Corn	Corn

* Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

COURTAULDS FIBRES CANADA

1.0 PLANT DESCRIPTION

Courtaulds Fibres Canada started operations in 1925 making continuous filament rayon. The plant is located in Cornwall, Ontario adjacent to the St. Lawrence River. Other plants that have operated with Courtaulds Fibres include Caravelle Carpets from 1971 to 1981 and Courtaulds Films from 1952 to 1989. Today Courtaulds Fibres produces only rayon fibre.

The rayon fibre is produced by first reacting dissolving grade pulpwood with caustic and carbon disulphide to produce viscose. The raw viscose solution is filtered and aged and then extruded through spinnerets into sulphuric acid baths containing zinc salts to form rayon filaments. The rayon filaments are stretched, chopped into staple, washed, bleached and treated with finish before drying and baling as a final product. Rayon fibre is used in the manufacture of clothing and non-woven products.

The cleaning of the viscose filters results in a highly alkaline (pH 10-11) wastewater. The subsequent wash baths are the major sources of acid and zinc wastes in the wastewaters discharged.

The old Caravelle Carpets building still exists on-site and has been converted into the new viscose production area. The Courtaulds Films plant has been shut down and reportedly only stormwater flows from the site to Courtaulds Fibres.

Process effluent, non-contact cooling water and stormwater are discharged directly to the river through six outfalls in combination with stormwater runoff effluents from the now closed Courtaulds Films and Caravelle Carpets plants.

There are no existing in-plant or end-of-pipe wastewater treatment systems at Courtaulds; however, some recycle/reuse techniques are employed within the manufacturing process.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

The Courtaulds Fibres Canada plant has permanently shutdown its operations as of November 30, 1992. The information in this report is provided as a matter of record only.

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Wastewater generation at the site including non-contact cooling water, stormwater runoff and stormwater runoff from the now closed Courtaulds Films and Caravelle Carpets plants are being discharged to the river through six outfalls. Table 1.0 presents the estimated outfall discharge flows from the plant.

TABLE 1.0
SEWERS AND ESTIMATED FLOW RATES AT COURTAULDS FIBRES

SEWER		ESTIMATED FLOW RATE*
PR 0100	Acid Sewer	8,500 m^3/d
PR 0300	Alkali Sewer	2,200 m^3/d
CO 0600	Acid/Recovery Sewer	3,400 m^3/d
CO 0800	Caravelle Sewer	13,000 m^3/d
CO 0700	CS_2 Sewer	6,000 m^3/d
CO 0500	Storm Sewer	19,000 m^3/d

* Obtained during the site visit.

The source flows to each of these sewers are presented in Table 2.0. The acid sewer serves the fibre spinning and finishing areas as well as sulphuric acid unloading and storage areas. The alkali sewer serves the fiber finishing area, viscose caves, soda storage and viscose manufacturing areas. The acid recovery sewer serves the acid recovery area as do both the Caravelle sewer and CS_2 sewer. The CS_2 sewer also serves the CS_2 storage and off loading area.

Functionally, there are cross connections between the sewers which have, on occasion, resulted in acidic flows in the storm sewer discharge. The extent of cross connections in the various sewer networks is not known.

Stormwater is discharged from various plant drainage areas by a separated storm sewer system (MISA Control Point CO 0500). The storm sewer from the Courtaulds Films plant originally carried films process effluent but since the films plant is no longer operating, the storm sewer reportedly carries stormwater only.

Table 2.0
Wastewater Sources at Courtaulds

Source	Type	Destination
	Viscose Production	
Churn vacuum jet	Steam condensate	Alkali sewer
Basket filter	Solid residue	Off-site disposal
Floor drains	Spills	Holding pit
Holding tanks	Off-spec material	Holding pit
	Viscose Conditioning	
Primary filters	Solid residue	Off-site disposal
De-aeration vacuum jet	Steam condensate	filters
Caustic filters (in caustic make-up)	Wash water	Alkali Sewer
Final filters		Alkali sewer
Floor drains	Filter wash water	
Filter cloth wash	Spills/wash water	Alkali sewer
	Wash water	Alkali sewer
		Alkali sewer
	Fibre Spinning	
Viscose feed	Drained viscose	Alkali sewer
Tow fibre	Acid carry over	Acid recovery process
Floor drains	Equipment wash water	Acid sewer
Spinneret wash	Chromic acid wash water	Acid sewer
Hot stretch tank	Acid bath	Acid sewer
	Fibre Finishing	
Prewash	Wash water	Acid sewer
Fibre wash	Sodium sulphide solution	Alkali sewer
Fibre wash	Sodium hypochlorite solution	Alkali sewer
Fibre lubrication	Sodium oleate, et. al.	Alkali sewer
Floor drains (acid)	Spills	Acid sewer
Floor drains (alkali)	Spills	Alkali sewer
	Acid Recovery	
Evaporators	CCW[1]	CS_2 sewer
Evaporator vacuum jet	Condensator	Caravelle sewer
Crystallizer	CCW	Acid recovery sewer
Crystallizer vacuum jet	Condensate	Acid recovery sewer
Acid filter	Spin-bath muds	Acid recovery sewer
Evaporators	Sodium sulphide wash	Off-site disposal
Floor drains	Wash water	Acid recovery sewer
	CS_2 Tanker Area	
Rail tankers	Blowdown water	Sump
Sump	Drain water	CS_2 Sewer
CS_2 storage	Moat water	CS_2 Sewer
	Utilities	
Compressor building	Cooling water	Reclaim tank
Reclaim tank	Overflow	Storm sewer
Water softening	Backwash	Acid Recovery
Boilers	Continuous blowdown	Acid Recovery
Water Softening	Tank wash	Acid Recovery
	Loading Areas	
Caustic loading	Spills	Caustic Recovery
Sulphuric loading	Spills	Acid sewer

NOTE: CCW - Contact Cooling Water

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario, and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options is addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period were determined to be consistently acutely lethal to Daphnia Magna and Rainbow Trout for MISA Control Point PR 0100 (Acid Sewer) and MISA Control Point PR 0300 (Alkali Sewer).

Furthermore, MISA Control Points CO 0600 and CO 0700 were found to be acutely lethal on two occasions during the same monitoring period.

An assessment of both the toxicity and effluent concentrations data by MOE's Aquatic Toxicity Unit indicated that MISA Control Points PR 0100 and PR 0300 were consistently among the most toxic in the OCM Sector. The LC50 values for these outfalls range from 0.9% to 7.6% effluent (Ref. 2). The source of the toxicity was partially attributed to the effluents' extreme pH conditions and a mixture of several other toxic contaminants. One effluent (PR 0100) was consistently measured to have a pH reading of 1.4 and the other (PR 0300) was measured at 11.8. In addition to the extreme pH conditions of Courtaulds effluent samples, which alone could have accounted for the observed mortalities, the bioassay fish were

also challenged by high concentrations of sulphide, zinc, lead, nickel, and mercury. These contaminants were consistently measured in Courtaulds' effluents (PR 0100 and PR 0300) at lethal or sublethal concentrations.

Based on these results, a supplementary Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Points CO 0600 and CO 0700 to assess the toxicity problems identified. In addition, neutralization is recommended for the CO 0600 and CO 0700 discharges. A TIE study is also recommended for MISA Control Points PR 0100 and PR 0300. A series of guidance documents for conducting Toxicity Reduction Evaluations (TRE's) are available from the U.S. Environmental Protection Agency (Ref. 3).

In addition, based on the analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 0100 and PR 0300, it is recommended that the following treatment system being installed to control the contaminants present at these two outfalls:

<u>MISA Control Point PR 0100 Recommended Technologies:</u>

- Oil separation
- Zinc recovery
- Equalization
- Steam stripping

<u>MISA Control Point PR 0300 Recommended Technologies:</u>

- Oil separation
- Chemically assisted clarification
- Steam stripping

As an alternative to the treatment technologies listed above, Courtaulds may also install the technologies recommended for BAT Option 2, i.e, biological treatment, to achieve a non-lethal effluent.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies found at similar U.S. or Ontario organic chemical manufacturing plants that, if installed, will achieve the maximum overall pollutant reduction. BAT Option 2 recommendations are summarized below by MISA Control Point.

3.2.1 MISA Control Point PR 0100 (Acid Sewer)

The draft analytical results obtained for the MISA OCM Sector Twelve Month Report for this effluent discharge showed elevated concentrations of conventional pollutants and metals. High concentrations were detected for DOC (210 mg/l), TOC (211 mg/l), COD (537 mg/l), TSS (91 mg/l), VSS (73 mg/l), oil and grease (100.7 mg/l), aluminum (349.3 ug/l), chromium (115.5 ug/l), copper (61.2 ug/l), lead (238.0 ug/l), zinc (52,384.9 ug/l), hexavalent chromium (47 ug/l), and sulphide (29,656.4 ug/l). Based on these results and a search for methods of treatment for these contaminants at other U.S. plants, it is recommended that oil separation, zinc recovery, primary clarification (chemically assisted), equalization, biological treatment (activated sludge plus secondary clarification), and multi-media filtration be installed at MISA Control Point PR 0100 for BAT Option 2.

3.2.2 MISA Control Point PR 0300 (Alkali Sewer)

The draft analytical results for this effluent discharge as obtained from the MISA OCM Sector Twelve Month Report showed elevated concentrations for the following pollutants: DOC (80.2 mg/l), TOC (98 mg/l), COD (810 mg/l), oil and grease (62.1 mg/l), zinc (2,459.9 ug/l), and sulphide (94,172.1 ug/l). Based on these results and a search for methods of treatment for these contaminants at other U.S. plants, it is recommended that oil separation be installed with the effluent from the oil separation unit being discharged to the primary clarifier recommended for BAT Option 2 for MISA Control Point PR 0100; the wastewater would then follow the same treatment system described for MISA Control Point PR 0100.

3.2.3 MISA Control Point 0700 (CS_2 Sewer)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for the CS_2 Sewer showed that the current pollutant discharge levels are as low or lower than discharge levels for similar U.S. and OCM Sector plants with the exception of zinc and sulphide. Sulphide and zinc were detected at an average concentration of 1,218.1 ug/l and 1,661.3 ug/l. It is recommended that the CS_2 sewer discharge be routed to the primary clarifier recommended for MISA Control Points PR 0100 and PR 0300 for control of sulphide and zinc.

3.2.4 MISA Control Point CO 0600 (Acid Recovery Sewer)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0600 generally showed low concentrations of contaminants with the exception of zinc and sulphide. Zinc was detected at an average concentration of 1,275.3 ug/l while sulfide was detected at an average concentration of 991.3 ug/l. The sources of contamination for this sewer are condensate from

steam vacuum jets of the spin bath evaporators and crystallizers. A sewer segregation is recommended that will allow the rerouting of the condensate from the steam vacuum jets at the spin bath evaporators and crystallizers to the acid sewer (PR 0100) and will most probably eliminate any sources of contamination to the acid recovery sewer. The remaining streams flowing to CO 0600 will be non-contact cooling water and basically free of any contamination.

3.2.5 MISA Control Point CO 0800 (Caravelle Sewer)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0600 generally showed low concentrations of contaminants with the exception of zinc and sulphide. Zinc was detected at an average concentration of 1,810.3 ug/l while sulphide was detected at an average concentration of 1,271.8 ug/l. A sewer segregation is recommended that will allow the separation of process wastewaters (such as acid recovery evaporator vacuum jet wastewater) and rerouting of any sources of contamination to this sewer to the acid sewer (PR 0100) and will most probably eliminate any high concentrations of contaminants from the Caravelle Sewer. The remaining streams flowing to CO 0800 will be non-contact cooling water and basically free of any contamination.

3.2.6 MISA Control Point CO 0500 (Storm Sewer)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for the storm sewer generally showed low effluent concentrations with the exception of zinc and sulphide. Zinc was detected at an average concentration of 315.2 ug/l while sulphide was detected at an average concentration of 3,674.5 ug/l. It is believed that the plant's sewer system which has many cross connections causing contamination of relatively clean wastestreams is the cause of the elevated concentrations of zinc and sulphide found at CO 0500. With the sewer segregation recommended, this problem will be eliminated and the storm sewer will be relatively free of any contaminants.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and zero discharge of contaminants and consists of any current technology or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors. Based on the pollutant concentrations in the effluents after implementation of BAT Option 1/2, granular activated carbon and multi-media filtration are recommended to further control zinc and to reduce DOC, TOC, and COD effluent concentrations as well as other organics and metals present in the wastestream. Granular activated carbon and multi-media filtration are recommended for the combined effluent from the biological treatment system recommended for BAT Option 2 (PR 0100 and PR 0300)

and other process wastestreams that have been routed to the biological treatment system from other MISA Control Points.

No additional treatment is recommended for BAT Option 3 for the remaining MISA Control Points CO 0500, CO 0600, CO 0700, and CO 0800.

3.4 SUMMARY OF BAT OPTIONS

Table 3.0 presents a summary of BAT options recommended for this plant.

4.0 SUMMARY OF BAT OPTIONS

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

It should be noted that BAT Option 1, 2 and 3 effluent concentrations and loadings at MISA Control Points CO 0500, CO 0600 and CO 0800 have been projected equal to either intake water levels or the RMDL based on the elimination of process wastewaters to these sewers. Also, the effluent concentrations and corresponding loadings for MISA Control Point CO 0700 (CS_2 sewer) have been made consistent with the effluent quality projected from the biological treatment system (PR 0100 and PR 0300) since it will be routed to this system.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report, plus two standard deviations was used as the design flow to estimate compliance costs from previously developed cost curves. For Courtaulds, a second standard deviation was considered necessary to account for the process wastestreams routed to the recommended treatment units from the separation of the storm, acid recovery, CS_2 and Caravelle sewers. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual cost may be higher or lower.

TABLE 3.0 SUMMARY OF BAT OPTIONS FOR COURTAULDS FIBRES CANADA		
BAT OPTION	DEFINITION	DESCRIPTION
A) MISA CONTROL POINT PR 0100 (ACID SEWER)		
1	Non-Lethal effluent	Oil separation, zinc recovery, and steam stripping plus TIE
2	USA/Ontario BAT/Maximum Pollutant Reduction	Oil separation, zinc recovery, primary clarification, equalization, activated sludge and secondary clarification
3	Zero Discharge/Virtual Elimination	Option 2 plus Granular Activated Carbon and Multi-media Filtration
B) MISA CONTROL POINT PR 0300 (ALKALI SEWER)		
1	Non-Lethal effluent	Oil separation, chemically assisted clarification, steam stripping plus TIE
2	USA/Ontario BAT/Maximum Pollutant Reduction	Oil separation with the effluent from oil separation discharged to primary clarifier of PR 0100 and follow PR 0100 treatment scheme
3	Zero Discharge/Virtual Elimination	Same as PR 010O treatment
C) MISA CONTROL POINT CO 0500 (STORM SEWER)		
1	Non-Lethal effluent	No additional treatment (NAT)
2	USA/Ontario BAT/Maximum Pollutant Reduction	NAT (Elimination of alkaline and acid sewer process discharges)
3	Zero Discharge/Virtual Elimination	Same as Option 2
D) MISA CONTROL POINT CO 0600 (ACID/RECOVERY SEWER)		
1	Non-Lethal effluent	Neutralization plus TIE
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment after sewer segregation
3	Zero Discharge/Virtual Elimination	Same as Option 2
E) MISA CONTROL POINT CO 0700 (CS_2 SEWER)		
1	Non-Lethal effluent	Neutralization plus TIE
2	USA/Ontario BAT/Maximum Pollutant Reduction	Route CS_2 wastewater to biological treatment system
3	Zero Discharge/Virtual Elimination	Same as Option 2
F) MISA CONTROL POINT 0800 (CARAVELLE SEWER)		
1	Non-Lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	NAT after elimination process discharges to the Caravelle Sewer
3	Zero Discharge/Virtual Elimination	Same as Option 2

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The sources of the cost estimates associated with the control technologies considered for Courtaulds Fibres Canada are presented below in Table 4.0.

TABLE 4.0	
BAT TECHNOLOGY	SOURCE OF COST ESTIMATES
Granular Activated Carbon (GAC)/Multi-media Filtration/Steam Stripping/Chemically Assisted Primary Clarification	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibres Point Source Category. EPA 440/1-87/009 October 1987 (Ref. 4)
Equalization, Neutralization	CAPDET Computer Program
Oil Separation	Obtained from Vendor Quotes
Zinc Recovery	Courtaulds North America
Biological Treatment[(1)]	CAPDET Computer Program
NOTE: (1) Biological treatment includes primary clarification, equalization, activated sludge, secondary clarification and sludge handling and disposal (belt filter press, landfill)	

Table 5.0 presents the cost estimates for the technologies considered for each BAT option for Courtaulds Fibres Canada. Cost estimates for the development and implementation of a TIE study and sewer segregation could not be developed due to their site-specific nature.

TABLE 5.0
BAT OPTION MODELS COST ESTIMATES
COURTAULDS FIBRES CANADA

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
PR 0100	8,207	NA 1,024,700 9,427,000 2,447,100 12,898,800	NA NA 2,024,000 9,023,500 11,047,500	TIE API ZINC REC. SS TOTAL	1,024,700 9,427,000 29,407,800 39,859,500	NA 2,024,000 1,548,800 3,572,800	API ZINC REC. BIO*** TOTAL	39,859,500 15,534,700 1,660,200 57,054,400	3,572,800 1,543,400 114,500 5,230,700	OPTION 2 GAC FIL TOTAL
PR 0300	5,137	NA 788,500 935,000 2,008,900 3,732,400	NA NA 95,700 4,211,200 4,306,900	TIE API CAC SS TOTAL	788,500 * 788,500	NA * NA	API BIO*** TOTAL	788,500 ** ** 788,500	NA ** ** NA	OPTION 2 GAC FIL TOTAL
CO 0500	14,654	0	0	NAT	0	0	NAT	0	0	NAT
CO 0600	38,559	NA 1,321,900	NA 118,800	TIE NEU	0	0	NAT	0	0	NAT
CO 0700	7,888	NA 437,100	NA 68,100	TIE NEU	*	*	BIO***	** **	** **	GAC FIL
CO 0800	15,883	0	0	NAT	0	0	NAT	0	0	NAT

NOTES:

NA - Cost estimates not developed
TIE - Toxicity Investigation Evaluation
API - API Oil Separator
SS - Steam Stripper
NEU - Neutralization
NAT - No Additional Treatment

ZINC REC. - Zinc Recovery
EQUAL - Equalization
FIL - Multimedia Filtration
GAC - Granular Activated Carbon
CAC - Chemically Assisted Clarification

* - Cost estimates for PR 0300 and CO 0700 are included in the cost estimated developed for PR 0100 for Option 2.
** - Cost estimates for PR 0300 and CO 0700 for these technologies are included in the cost estimated developed for PR 0100 for Option 3.
*** - Biological treatment includes primary clarification, equalization, activated sludge, secondary clarification and sludge handling and disposal.

6.0 REFERENCES

1. Courtaulds Fibres Canada. BAT Status of the OCM Sector Plants Site Visit Information Report, March 18-19, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirer, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibre Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR COURTAULDS FIBRES CANADA

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – COURTAULDS FIBRES CANADA – CORNWALL

ATG	PARAMETER	RMDL	UNIT	IN 1300	PR 0100	PR 0300	CO 0500	CO 0600	CO 0700	CO 0800
1	COD	10	mg/L	15	537	810	28	16	17	131
2	Cyanide Total	0.005	mg/L	0.001	0.004	0.007	0.001	0.001	0.001	0.001
3	Hydrogen ion (pH)			8.0	2.1	11.1	7.7	6.9	6.6	6.7
4	Ammonia plus Ammonium	0.25	mg/L	0.18	0.25	0.16	0.05	0.15	0.11	0.10
4	Nitrate+Nitrite	0.25	mg/L	0.24	0.48	0.37	0.80	0.63	0.41	0.32
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.2	0.6	1.2	0.4	0.2	0.2	0.3
5	DOC	0.5	mg/L	4.0	210.0	80.2	6.5	4.9	5.0	5.1
5	TOC	5	mg/L	3	211	98	6	4	4	4
6	Total phosphorus	0.10	mg/L	0.15	0.14	0.12	0.12	0.08	0.10	0.08
7	Specific conductance	5	uS/cm	310	8299	3388	366	411	386	433
8	Total suspended solids	5	mg/L	1	91	111	13	9	7	7
8	Volatile suspended solids	10	mg/L	1	73	56	8	7	6	6
9	Aluminum	30.0	ug/L	125.2	394.3	205.7	178.7	89.7	110.5	96.8
9	Boron	50.0	ug/L	62.3	50.4	41.0	28.8	27.2	26.3	32.0
9	Cadmium	2.0	ug/L	1.8	3.2	1.5	1.3	1.3	1.3	1.3
9	Chromium	20.0	ug/L	3.4	115.5	49.4	16.7	5.9	4.9	8.5
9	Copper	10.0	ug/L	4.1	61.2	26.2	32.3	24.1	8.6	7.0
9	Lead	30.0	ug/L	9.7	238.0	91.9	11.8	12.0	12.0	13.5
9	Nickel	20.0	ug/L	4.7	32.8	14.6	7.4	7.2	6.3	8.0
9	Zinc	10.0	ug/L	79.7	52384.9	2459.9	560.4	1242.6	1489.6	1410.5
10	Antimony	5.0	ug/L	2.5	7.3	1.8	2.0	1.4	2.0	2.0
11	Chromium (hexavalent)	10.0	ug/L	20.0	47.0	–	18.0	–	20.0	20.0
12	Mercury	0.10	ug/L	0.07	10.26	4.73	0.27	0.18	0.18	0.14
14	Phenolics (4AAP)	2.0	ug/L	2.2	17.4	18.6	2.5	3.7	3.1	3.6
15	Sulphide	20.0	ug/L	191.9	29656.4	94172.1	4029.7	1097.3	1628.3	1308.7

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – COURTAULDS FIBRES CANADA – CORNWALL

ATG	PARAMETER	RMDL	UNIT	IN 1300	PR 0100	PR 0300	CO 0500	CO 0600	CO 0700	CO 0800
16	1,2–Dichloroethane	0.8	ug/L	0.5	1.1	1.1	1.1	1.1	1.4	1.1
16	Chloroform	0.7	ug/L	2.1	31.9	15.6	1.6	1.2	1.3	1.3
16	Methylene chloride	1.3	ug/L	1.8	1.1	3.8	1.9	1.7	2.0	2.3
17	Toluene	0.5	ug/L	0.4	1.1	1.2	0.8	2.7	6.0	4.9
19	Diphenyl ether	0.4	ug/L	0.5	0.5	0.5	0.3	0.3	0.3	0.3
20	Phenol	2.4	ug/L	0.7	2.1	1.6	0.8	0.7	0.7	0.7
25	Oil and grease	1.0	mg/L	0.8	100.7	62.1	1.9	1.7	1.8	3.6
98	Ftflow		m3/day	–	5426	1524	10077	31604	6447	11167

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS:
IN 1300 – Intake to Site
PR 0100 – Acid Sewer to River
PR 0300 – Alkaline Sewer to River
CO 0500 – Storm Sewer to River
CO 0600 – Acid Recovery Sewer to River
CO 0700 – CS2 Sewer to River
CO 0800 – Caravelle Sewer to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – COURTAULDS FIBRES CANADA – CORNWALL

ATG	PARAMETER	IN 1300	PR 0100	PR 0300	CO 0500	CO 0600	CO 0700	CO 0800	TOTAL
1	COD	1032.725	3405.330	1417.503	241.493	595.836	104.605	1184.212	6948.979
2	Cyanide Total	0.098	0.030	0.019	0.008	0.044	0.007	0.013	0.121
4	Ammonia plus Ammonium	12.355	1.678	0.210	0.288	4.691	0.876	0.868	8.611
4	Nitrate+Nitrite	15.977	2.484	0.586	5.775	21.009	2.439	3.240	35.533
4	Total Kjeldahl Nitrogen	81.175	3.219	0.988	2.228	8.421	1.493	2.530	18.879
5	DOC	273.664	1066.466	124.576	58.955	153.143	33.229	57.521	1493.890
5	TOC	174.964	1063.755	155.111	50.426	120.620	26.580	41.438	1457.930
6	Total phosphorus	10.197	0.811	0.206	1.046	2.423	0.601	0.902	5.989
8	Total suspended solids	71.593	497.948	172.095	137.350	261.414	46.346	76.809	1191.962
8	Volatile suspended solids	71.593	393.743	74.958	71.534	200.989	41.462	63.469	846.155
9	Aluminum	8.123	1.970	0.295	1.579	2.906	0.679	0.987	8.416
9	Boron	4.515	0.230	0.065	0.276	0.887	0.159	0.331	1.948
9	Cadmium	0.116	0.015	0.002	0.012	0.040	0.008	0.013	0.090
9	Chromium	0.226	0.612	0.055	0.160	0.181	0.029	0.087	1.124
9	Copper	0.271	0.307	0.039	0.156	0.772	0.055	0.074	1.403
9	Lead	0.627	1.257	0.155	0.113	0.394	0.073	0.147	2.139
9	Nickel	0.317	0.156	0.022	0.079	0.241	0.038	0.088	0.624
9	Zinc	5.701	273.601	2.932	5.074	37.717	10.144	15.923	345.391
10	Antimony	0.175	0.038	0.006	0.024	0.055	0.014	0.021	0.158
11	Chromium (hexavalent)	1.278	0.255	–	0.178	–	0.119	0.226	0.778
12	Mercury	0.004	0.056	0.007	0.002	0.006	0.001	0.002	0.074
14	Phenolics (4AAP)	0.140	0.092	0.044	0.027	0.139	0.021	0.037	0.360
15	Sulphide	13.699	161.415	147.138	41.909	34.238	10.678	14.614	409.992

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – COURTAULDS FIBRES CANADA – CORNWALL

ATG	PARAMETER	IN 1300	PR 0100	PR 0300	CO 0500	CO 0600	CO 0700	CO 0800	TOTAL
16	1,2–Dichloroethane	0.035	0.005	0.001	0.009	0.033	0.009	0.012	0.069
16	Chloroform	0.127	0.169	0.022	0.013	0.038	0.008	0.015	0.265
16	Methylene chloride	0.111	0.005	0.007	0.014	0.053	0.013	0.023	0.115
17	Toluene	0.023	0.004	0.001	0.007	0.089	0.038	0.052	0.191
19	Diphenyl ether	0.033	0.003	0.001	0.003	0.010	0.002	0.003	0.022
20	Phenol	0.049	0.010	0.002	0.008	0.027	0.005	0.007	0.059
25	Oil and grease	55.933	517.943	87.482	19.559	53.911	12.044	36.326	727.265

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 1300 – Intake Water to Site
PR 0100 – Acid Sewer to River
PR 0300 – Alkaline Sewer to River
CO 0500 – Storm Sewer to River
CO 0600 – Acid Recovery Sewer to River
CO 0700 – CS2 Sewer to River
CO 0800 – Caravelle Sewer to River

APPENDIX B

PERFORMANCE DATA OF SELECTED BAT OPTIONS
COURTAULDS FIBRES CANADA

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - COURTAULDS FIBRES CANADA - CORNWALL

CONTROL POINT - PR 0100 Acid Sewer to River
AVERAGE FLOWRATE = 5426 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	537	3405 330	537	3405 330	90	488 340	31	168 206	Crtcorn	Crtna	Esso
2	Cyanide Total	0 005	mg/L	0 004	0 030	0 004	0 030	0 004	0.030	0 004	0 030	Crtcorn	Crtcorn	Crtcorn
4	Ammonia plus Ammonium	0.25	mg/L	0 25	1 678	0.25	1 678	0.25	1 678	0.25	1.678	Crtcorn	Crtcorn	Crtcorn
4	Nitrate+Nitrite	0.25	mg/L	0.48	2 484	0 48	2 484	0.48	2 484	0 48	2 484	Crtcorn	Crtcorn	Crtcorn
4	Total Kjeldahl Nitrogen	0.5	mg/L	0 6	3 219	0.6	3 219	0.6	3 219	0.6	3.219	Crtcorn	Crtcorn	Crtcorn
5	DOC	0.5	mg/L	210.0	1066.466	210.0	1066 466	16.7	90.614	4.4	23 874	Crtcorn	Poly	Esso
5	TOC	5	mg/L	211	1063 755	211	1063 755	30	162 780	5	27.130	Crtcorn	Crtna	Esso
6	Total phosphorus	0.10	mg/L	0.14	0.811	0.14	0.811	0.14	0.811	0.14	0.811	Crtcorn	Crtcorn	Crtcorn
8	Total suspended solids	5	mg/L	91	497.948	91	497 948	20	108 520	5	27.130	Crtcorn	Crtna	P1774
8	Volatile suspended solids	10	mg/L	73	393.743	73	393 743	12	65.112	5	27.130	Crtcorn	Crtna	P1774
9	Aluminum	30 0	ug/L	394 3	1.970	394 3	1.970	394.3	1.970	47.0	0.255	Crtcorn	Crtcorn	RREL
9	Boron	50.0	ug/L	50 4	0 230	50 4	0.230	50 4	0.230	50.4	0.230	Crtcorn	Crtcorn	Crtcorn
9	Cadmium	2 0	ug/L	3 2	0.015	3 2	0.015	3 20	0 015	3 20	0.015	Crtcorn	Crtcorn	Crtcorn
9	Chromium	20.0	ug/L	115 5	0.612	115.5	0.612	50.0	0 271	17 0	0.092	Crtcorn	Crtna	RREL
9	Copper	10.0	ug/L	61 2	0.307	61 2	0.307	50 0	0.271	20 0	0.109	Crtcorn	Crtna	RREL
9	Lead	30 0	ug/L	238 0	1 257	238 0	1.257	50.0	0.271	50.0	0.271	Crtcorn	Crtna	Crtna
9	Nickel	20 0	ug/L	32.8	0.156	32 8	0.156	32 8	0.156	32.8	0.156	Crtcorn	Crtcorn	Crtcorn
9	Zinc	10.0	ug/L	52384 9	273 601	14900 0	80 847	1000.0	5 426	73 0	0.396	Crtna	Crtna	RREL
10	Antimony	5.0	ug/L	7 3	0.038	7.3	0 038	7 3	0 038	7 3	0.038	Crtcorn	Crtcorn	Crtcorn
11	Chromium (hexavalent)	10.0	ug/L	47 0	0 255	47 0	0.255	47 0	0.255	47.0	0.255	Crtcorn	Crtcorn	Crtcorn
12	Mercury	0.10	ug/L	10.26	0.056	10.26	0.056	1 0	0.005	1.0	0.005	Crtcorn	Crtna	Crtna
14	Phenolics (4AAP)	2 0	ug/L	17 4	0.092	17 4	0.092	10.1	0.055	2.5	0.014	Crtcorn	Poly	Esso
15	Sulphide	20.0	ug/L	29656.4	161.415	900 0	4.883	900.0	4 883	900.0	4.883	Crtna	Crtna	Crtna
16	1,2-Dichloroethane	0.8	ug/L	1.1	0.005	1.1	0.005	1.1	0.005	1.1	0.005	Crtcorn	Crtcorn	Crtcorn
16	Chloroform	0.7	ug/L	31 9	0.169	10 47	0.057	10.47	0.057	1.2	0.007	Crtcorn	415P	Esso
16	Methylene chloride	1 3	ug/L	1.1	0 005	1.1	0.005	1.1	0.005	1.1	0.005	Crtcorn	Crtcorn	Crtcorn
17	Toluene	0.5	ug/L	1.1	0.004	1.1	0.004	1 1	0 004	1.1	0.004	Crtcorn	Crtcorn	Crtcorn
19	Diphenyl ether	0 4	ug/L	0.5	0.003	0.5	0.003	0.5	0.003	0 5	0.003	Crtcorn	Crtcorn	Crtcorn
20	Phenol	2 4	ug/L	2.1	0.010	2.1	0.010	2 1	0.010	2.1	0.010	Crtcorn	Crtcorn	Crtcorn
25	Oil and grease	1.0	mg/L	100.7	517.943	4.1	22 247	4 1	22.247	4.1	22.247	Amoco	Amoco	Amoco

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - COURTAULDS FIBRES CANADA - CORNWALL

CONTROL POINT - PR 0300 Alkaline Sewer to River
AVERAGE FLOWRATE = 1524 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL A ERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	810	1417.503	810	1417.503	90.0	137.160	31.0	47.244	Crtcorn	Crtna	Esso
2	Cyanide Total	0.005	mg/L	0.007	0.019	0.007	0.019	0.007	0.019	0.007	0.019	Crtcorn	Crtcorn	Crtcorn
4	Ammonia plus Ammonium	0.25	mg/L	0.16	0.210	0.16	0.210	0.16	0.210	0.16	0.210	Crtcorn	Crtcorn	Crtcorn
4	Nitrate+Nitrite	0.25	mg/L	0.37	0.586	0.37	0.586	0.37	0.586	0.37	0.586	Crtcorn	Crtcorn	Crtcorn
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.2	0.988	1.2	0.988	1.2	0.988	1.2	0.988	Crtcorn	Crtcorn	Crtcorn
5	DOC	0.5	mg/L	80.2	124.576	80.2	124.576	16.9	25.756	4.4	6.706	Crtcorn	Polysar	Esso
5	TOC	5	mg/L	98	155.111	98	155.111	30.0	45.720	5.0	7.620	Crtcorn	Crtna	Esso
6	Total phosphorus	0.10	mg/L	0.12	0.206	0.12	0.206	0.12	0.206	0.12	0.206	Crtcorn	Crtcorn	Crtcorn
8	Total suspended solids	5	mg/L	111	155.111	39	59.436	20.0	30.480	5.0	7.620	OCPSF	Crtna	P1774
8	Volatile suspended solids	10	mg/L	56	74.958	56	74.958	12	18.288	5.0	7.620	Crtcorn	Crtna	P1774
9	Aluminum	30.0	ug/L	205.7	0.295	205.7	0.295	205.7	0.295	47.0	0.072	Crtcorn	Crtcorn	RREL
9	Boron	50.0	ug/L	41.0	0.065	41.0	0.065	41.0	0.065	41.0	0.065	Crtcorn	Crtcorn	Crtcorn
9	Cadmium	2.0	ug/L	1.5	0.002	1.5	0.002	1.5	0.002	1.5	0.002	Crtcorn	Crtcorn	Crtcorn
9	Chromium	20.0	ug/L	49.4	0.055	49.4	0.055	49.4	0.055	17.0	0.026	Crtcorn	Crtcorn	RREL
9	Copper	10.0	ug/L	26.2	0.039	26.2	0.039	26.2	0.039	20.0	0.030	Crtcorn	Crtcorn	RREL
9	Lead	30.0	ug/L	91.9	0.155	91.9	0.155	50.0	0.076	50.0	0.076	Crtcorn	Crtna	Crtna
9	Nickel	20.0	ug/L	14.6	0.022	14.6	0.022	14.6	0.022	14.6	0.022	Crtcorn	Crtcorn	Crtcorn
9	Zinc	10.0	ug/L	2459.9	2.932	2459.9	2.932	1000.0	1.524	73.0	0.111	Crtcorn*	Crtna	RREL
10	Antimony	5.0	ug/L	1.8	0.006	1.8	0.006	1.8	0.006	1.8	0.006	Crtcorn	Crtcorn	Crtcorn
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-			
12	Mercury	0.10	ug/L	4.73	0.007	4.73	0.007	1.00	0.002	1.00	0.002	Crtcorn	Crtna	Crtna
14	Phenolics (4AAP)	2.0	ug/L	18.6	0.044	18.6	0.044	10.1	0.015	2.5	0.004	Crtcorn	Polysar	Esso
15	Sulphide	20.0	ug/L	94172.1	147.138	900.0	1.372	900.0	1.372	900.0	1.372	Crtna	Crtna	Crtna
16	1,2-Dichloroethane	0.8	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	Crtcorn	Crtcorn	Crtcorn
16	Chloroform	0.7	ug/L	15.6	0.022	10.47	0.016	10.47	0.016	1.2	0.002	415P	415P	Esso
16	Methylene chloride	1.3	ug/L	3.8	0.007	3.8	0.007	3.8	0.007	3.8	0.007	Crtcorn	Crtcorn	Crtcorn
17	Toluene	0.5	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	Crtcorn	Crtcorn	Crtcorn
19	Diphenyl ether	0.4	ug/L	0.5	0.001	0.5	0.001	0.5	0.001	0.5	0.001	Crtcorn	Crtcorn	Crtcorn
20	Phenol	2.4	ug/L	1.6	0.002	1.6	0.002	1.6	0.002	1.6	0.002	Crtcorn	Crtcorn	Crtcorn
25	Oil and grease	1.0	mg/L	62.1	87.482	4.1	6.248	4.1	6.248	4.1	6.248	Amoco	Amoco	Amoco

* - No performance data available but reductions can be expected based on the addition of chemically assisted clarification recommended in BAT Option 1.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - COURTAULDS FIBRES CANADA - CORNWALL

CONTROL POINT - CO 0500 Storm Sewer to River
AVERAGE FLOWRATE = 10077 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	28	241 493	28	241 493	15	151.155	15	151.155	Crtcorn	RMDL/Intake	RMDL/Intake
2	Cyanide Total	0.005	mg/L	0.001	0 008	0.001	0.008	0.001	0.008	0.001	0 008	Crtcorn	RMDL/Intake	RMDL/Intake
4	Ammonia plus Ammonium	0.25	mg/L	0.05	0.288	0.05	0.288	0.05	0.288	0.05	0 288	Crtcorn	RMDL/Intake	RMDL/Intake
4	Nitrate+Nitrite	0.25	mg/L	0.80	5 775	0.80	5.775	0.80	5.775	0.80	5.775	Crtcorn	RMDL/Intake	RMDL/Intake
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	2.228	0.4	2.228	0.4	2 228	0.4	2.228	Crtcorn	RMDL/Intake	RMDL/Intake
5	DOC	0 5	mg/L	6.5	58 955	6.5	58.955	4.0	40.308	4.0	40.308	Crtcorn	RMDL/Intake	RMDL/Intake
5	TOC	5	mg/L	6	50.426	6	50.426	5	50.385	5	50.385	Crtcorn	RMDL/Intake	RMDL/Intake
6	Total phosphorus	0.10	mg/L	0.12	1 046	0.12	1.046	0.12	1.046	0.12	1 046	Crtcorn	RMDL/Intake	RMDL/Intake
8	Total suspended solids	5	mg/L	13	137 350	13	137.350	5	50.385	5	50 385	Crtcorn	RMDL/Intake	RMDL/Intake
8	Volatile suspended solids	10	mg/L	8	71 534	8	71.534	8	71.534	8	71.534	Crtcorn	RMDL/Intake	RMDL/Intake
9	Aluminum	30.0	ug/L	178.7	1.579	178.7	1.579	125.2	1.262	125.2	1.262	Crtcorn	RMDL/Intake	RMDL/Intake
9	Boron	50 0	ug/L	28.8	0.276	28.8	0.276	28 8	0.276	28.8	0.276	Crtcorn	RMDL/Intake	RMDL/Intake
9	Cadmium	2 0	ug/L	1.3	0.012	1.3	0.012	1 3	0.012	1.3	0.012	Crtcorn	RMDL/Intake	RMDL/Intake
9	Chromium	20.0	ug/L	16.7	0.160	16.7	0.160	3 4	0.034	3.4	0.034	Crtcorn	RMDL/Intake	RMDL/Intake
9	Copper	10.0	ug/L	32 3	0.156	32.3	0.156	10.0	0.101	10.0	0.101	Crtcorn	RMDL/Intake	RMDL/Intake
9	Lead	30.0	ug/L	11.8	0.113	11.8	0.113	11.8	0.113	11.8	0.113	Crtcorn	RMDL/Intake	RMDL/Intake
9	Nickel	20.0	ug/L	7.4	0.079	7.4	0.079	7.4	0.079	7.4	0.079	Crtcorn	RMDL/Intake	RMDL/Intake
9	Zinc	10.0	ug/L	560.4	5.074	560.4	5.074	79.7	0.803	79.7	0.803	Crtcorn	RMDL/Intake	RMDL/Intake
10	Antimony	5.0	ug/L	2.0	0.024	2.0	0.024	2 0	0.024	2.0	0 024	Crtcorn	RMDL/Intake	RMDL/Intake
11	Chromium (hexavalent)	10.0	ug/L	18.0	0.178	18.0	0.178	18 0	0.178	18.0	0.178	Crtcorn	RMDL/Intake	RMDL/Intake
12	Mercury	0.10	ug/L	0.27	0.002	0.27	0.002	0.27	0.002	0.27	0.002	Crtcorn	RMDL/Intake	RMDL/Intake
14	Phenolics (4AAP)	2.0	ug/L	2.5	0.027	2.5	0.027	2 2	0.022	2.2	0.022	Crtcorn	RMDL/Intake	RMDL/Intake
15	Sulphide	20.0	ug/L	4029.7	41.909	4029.7	41.909	191.9	1.934	191.9	1.934	Crtcorn	RMDL/Intake	RMDL/Intake
16	1,2-Dichloroethane	0.8	ug/L	1.1	0.009	1.1	0.009	0.8	0.008	0.8	0.008	Crtcorn	RMDL/Intake	RMDL/Intake
16	Chloroform	0.7	ug/L	1.6	0.013	1.6	0.013	1 6	0.013	1.6	0.013	Crtcorn	RMDL/Intake	RMDL/Intake
16	Methylene chloride	1 3	ug/L	1.9	0.014	1.9	0.014	1 9	0.014	1.9	0.014	Crtcorn	RMDL/Intake	RMDL/Intake
17	Toluene	0.5	ug/L	0.8	0.007	0.8	0.007	0.5	0.005	0.5	0.005	Crtcorn	RMDL/Intake	RMDL/Intake
19	Diphenyl ether	0.4	ug/L	0.3	0.003	0.3	0.003	0.3	0.003	0.3	0.003	Crtcorn	RMDL/Intake	RMDL/Intake
20	Phenol	2 4	ug/L	0.8	0.008	0.8	0.008	0.8	0.008	0.8	0.008	Crtcorn	RMDL/Intake	RMDL/Intake
25	Oil and grease	1.0	mg/L	1.9	19.559	1.9	19.559	1.0	10.078	1.0	10.078	Crtcorn	RMDL/Intake	RMDL/Intake

RMDL/Intake - Lower of these two values are used as a target

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - COURTAULDS FIBRES CANADA - CORNWALL

CONTROL POINT - CO 0600 Acid Recovery Sewer to River
AVERAGE FLOWRATE = 31604 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	16	595.836	16	595.836	15	474.060	15	474.060	Crtcorn	RMDL\Intake	RMDL\Intake
2	Cyanide Total	0.005	mg/L	0.001	0.044	0.001	0.044	0.001	0.044	0.001	0.044	Crtcorn	RMDL\Intake	RMDL\Intake
4	Ammonia plus Ammonium	0.25	mg/L	0.15	4.691	0.15	4.691	0.15	4.691	0.15	4.691	Crtcorn	RMDL\Intake	RMDL\Intake
4	Nitrate+Nitrite	0.25	mg/L	0.63	21.009	0.63	21.009	0.25	7.901	0.25	7.901	Crtcorn	RMDL\Intake	RMDL\Intake
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	8.421	0.2	8.421	0.2	8.421	0.2	8.421	Crtcorn	RMDL\Intake	RMDL\Intake
5	DOC	0.5	mg/L	4.9	153.143	4.9	153.143	4.0	126.416	4.0	126.416	Crtcorn	RMDL\Intake	RMDL\Intake
5	TOC	5	mg/L	4	120.620	4	120.620	4	120.620	4	120.620	Crtcorn	RMDL\Intake	RMDL\Intake
6	Total phosphorus	0.10	mg/L	0.08	2.423	0.08	2.423	0.08	2.423	0.08	2.423	Crtcorn	RMDL\Intake	RMDL\Intake
8	Total suspended solids	5	mg/L	9	261.414	9	261.414	5	158.020	5	158.020	Crtcorn	RMDL\Intake	RMDL\Intake
8	Volatile suspended solids	10	mg/L	7	200.989	7	200.989	7	200.989	7	200.989	Crtcorn	RMDL\Intake	RMDL\Intake
9	Aluminum	30.0	ug/L	89.7	2.906	89.7	2.906	89.7	2.906	89.7	2.906	Crtcorn	RMDL\Intake	RMDL\Intake
9	Boron	50.0	ug/L	27.2	0.887	27.2	0.887	27.2	0.887	27.2	0.887	Crtcorn	RMDL\Intake	RMDL\Intake
9	Cadmium	2.0	ug/L	1.3	0.040	1.3	0.040	1.3	0.040	1.3	0.040	Crtcorn	RMDL\Intake	RMDL\Intake
9	Chromium	20.0	ug/L	5.9	0.181	5.9	0.181	5.9	0.181	5.9	0.181	Crtcorn	RMDL\Intake	RMDL\Intake
9	Copper	10.0	ug/L	24.1	0.772	24.1	0.772	10.0	0.316	10.0	0.316	Crtcorn	RMDL\Intake	RMDL\Intake
9	Lead	30.0	ug/L	12.0	0.394	12.0	0.394	12.0	0.394	12.0	0.394	Crtcorn	RMDL\Intake	RMDL\Intake
9	Nickel	20.0	ug/L	7.2	0.241	7.2	0.241	7.2	0.241	7.2	0.241	Crtcorn	RMDL\Intake	RMDL\Intake
9	Zinc	10.0	ug/L	1242.6	37.717	1242.6	37.717	79.7	2.519	79.7	2.519	Crtcorn	RMDL\Intake	RMDL\Intake
10	Antimony	5.0	ug/L	1.4	0.055	1.4	0.055	1.4	0.055	1.4	0.055	Crtcorn	RMDL\Intake	RMDL\Intake
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-	Crtcorn	RMDL\Intake	RMDL\Intake
12	Mercury	0.10	ug/L	0.18	0.006	0.18	0.006	0.10	0.006	0.10	0.006	Crtcorn		
14	Phenolics (4AAP)	2.0	ug/L	3.7	0.139	3.7	0.139	2.2	0.070	2.2	0.070	Crtcorn	RMDL\Intake	RMDL\Intake
15	Sulphide	20.0	ug/L	1097.3	34.238	1097.3	34.238	191.9	6.065	191.9	6.065	Crtcorn	RMDL\Intake	RMDL\Intake
16	1,2-Dichloroethane	0.8	ug/L	1.1	0.033	1.1	0.033	0.8	0.025	0.8	0.025	Crtcorn	RMDL\Intake	RMDL\Intake
16	Chloroform	0.7	ug/L	1.2	0.038	1.2	0.038	1.2	0.038	1.2	0.038	Crtcorn	RMDL\Intake	RMDL\Intake
16	Methylene chloride	1.3	ug/L	1.7	0.053	1.7	0.053	1.7	0.053	1.7	0.053	Crtcorn	RMDL\Intake	RMDL\Intake
17	Toluene	0.5	ug/L	2.7	0.089	2.7	0.089	0.5	0.016	0.5	0.016	Crtcorn	RMDL\Intake	RMDL\Intake
19	Diphenyl ether	0.4	ug/L	0.3	0.010	0.3	0.010	0.3	0.010	0.3	0.010	Crtcorn	RMDL\Intake	RMDL\Intake
20	Phenol	2.4	ug/L	0.7	0.027	0.7	0.027	0.7	0.027	0.7	0.027	Crtcorn	RMDL\Intake	RMDL\Intake
25	Oil and grease	1.0	mg/L	1.7	53.911	1.7	53.911	1.0	31.604	1.0	31.604	Crtcorn	RMDL\Intake	RMDL\Intake

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - COURTAULDS FIBRES CANADA - CORNWALL

CONTROL POINT - CO 0700 CS2 Sewer to River
AVERAGE FLOWRATE = 6447 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV' RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	17	104.605	17	104.605	17	104.605	17	104.605	Crtcorn	Crtcorn	Crtcorn
2	Cyanide Total	0.005	mg/L	0.001	0.007	0.001	0.007	0.001	0.007	0.001	0.007	Crtcorn	Crtcorn	Crtcorn
4	Ammonia plus Ammonium	0.25	mg/L	0.11	0.876	0.11	0.876	0.11	0.876	0.11	0.876	Crtcorn	Crtcorn	Crtcorn
4	Nitrate+Nitrite	0.25	mg/L	0.41	2.439	0.41	2.439	0.41	2.439	0.41	2.439	Crtcorn	Crtcorn	Crtcorn
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	1.493	0.2	1.493	0.2	1.493	0.2	1.493	Crtcorn	Crtcorn	Crtcorn
5	DOC	0.5	mg/L	5.0	33.229	5.0	33.229	5.0	33.229	5.0	33.229	Crtcorn	Crtcorn	Crtcorn
5	TOC	5	mg/L	4	26.580	4	26.580	4	26.580	4	26.580	Crtcorn	Crtcorn	Crtcorn
6	Total phosphorus	0.10	mg/L	0.10	0.601	0.10	0.601	0.10	0.601	0.10	0.601	Crtcorn	Crtcorn	Crtcorn
8	Total suspended solids	5	mg/L	7	46.346	7	46.346	7	46.346	5	46.346	Crtcorn	Crtcorn	PR01/03
8	Volatile suspended solids	10	mg/L	6	41.462	6	41.462	6	41.462	5	41.462	Crtcorn	Crtcorn	PR01/03
9	Aluminum	30.0	ug/L	110.5	0.679	110.5	0.679	110.5	0.679	47.0	0.303	Crtcorn	Crtcorn	PR01/03
9	Boron	50.0	ug/L	26.3	0.159	26.3	0.159	26.3	0.159	26.3	0.159	Crtcorn	Crtcorn	Crtcorn
9	Cadmium	2.0	ug/L	1.3	0.008	1.3	0.008	1.3	0.008	1.3	0.008	Crtcorn	Crtcorn	Crtcorn
9	Chromium	20.0	ug/L	4.9	0.029	4.9	0.029	4.9	0.029	4.9	0.029	Crtcorn	Crtcorn	Crtcorn
9	Copper	10.0	ug/L	8.6	0.055	8.6	0.055	8.6	0.055	8.6	0.055	Crtcorn	Crtcorn	Crtcorn
9	Lead	30.0	ug/L	12.0	0.073	12.0	0.073	12.0	0.073	12.0	0.073	Crtcorn	Crtcorn	Crtcorn
9	Nickel	20.0	ug/L	6.3	0.038	6.3	0.038	6.3	0.038	6.3	0.038	Crtcorn	Crtcorn	Crtcorn
9	Zinc	10.0	ug/L	1489.6	10.144	1489.6	10.144	1000.0	6.447	42.0	0.271	Crtcorn	PR01/03	PR01/03
10	Antimony	5.0	ug/L	2.0	0.014	2.0	0.014	2.0	0.014	2.0	0.014	Crtcorn	Crtcorn	Crtcorn
11	Chromium (hexavalent)	10.0	ug/L	20.0	0.119	20.0	0.119	20.0	0.119	20.0	0.119	Crtcorn	Crtcorn	Crtcorn
12	Mercury	0.10	ug/L	0.18	0.001	0.18	0.001	0.18	0.001	0.18	0.001	Crtcorn	Crtcorn	Crtcorn
14	Phenolics (4AAP)	2.0	ug/L	3.1	0.021	3.1	0.021	3.1	0.021	3.1	0.021	Crtcorn	Crtcorn	Crtcorn
15	Sulphide	20.0	ug/L	1628.3	10.678	1628.3	10.678	900.0	5.802	900.0	5.802	Crtcorn	PR01/03	PR01/03
16	1,2-Dichloroethane	0.8	ug/L	1.4	0.009	1.4	0.009	1.4	0.009	1.4	0.009	Crtcorn	Crtcorn	Crtcorn
16	Chloroform	0.7	ug/L	1.3	0.008	1.3	0.008	1.3	0.008	1.3	0.008	Crtcorn	Crtcorn	Crtcorn
16	Methylene chloride	1.3	ug/L	2.0	0.013	2.0	0.013	2.0	0.013	2.0	0.013	Crtcorn	Crtcorn	Crtcorn
17	Toluene	0.5	ug/L	6.0	0.038	6.0	0.038	6.0	0.038	6.0	0.038	Crtcorn	Crtcorn	Crtcorn
19	Diphenyl ether	0.4	ug/L	0.3	0.002	0.3	0.002	0.3	0.002	0.3	0.002	Crtcorn	Crtcorn	Crtcorn
20	Phenol	2.4	ug/L	0.7	0.005	0.7	0.005	0.7	0.005	0.7	0.005	Crtcorn	Crtcorn	Crtcorn
25	Oil and grease	1.0	mg/L	1.8	12.044	1.8	12.044	1.8	12.044	1.8	12.044	Crtcorn	Crtcorn	Crtcorn

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - COURTAULDS FIBRES CANADA - CORNWALL

CONTROL POINT - CO 0800 Caravelle Sewer to River
AVERAGE FLOWRATE = 11167 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	131	1184.212	131	1184.212	15	167.505	15	167.505	Crtcom	RMDL/Intake	RMDL/Intake
2	Cyanide Total	0.005	mg/L	0.001	0.013	0.001	0.013	0.001	0.013	0.001	0.013	Crtcom	RMDL/Intake	RMDL/Intake
4	Ammonia plus Ammonium	0.25	mg/L	0.10	0.868	0.10	0.868	0.10	0.868	0.10	0.868	Crtcom	RMDL/Intake	RMDL/Intake
4	Nitrate+Nitrite	0.25	mg/L	0.32	3.240	0.32	3.240	0.25	2.792	0.25	2.792	Crtcom	RMDL/Intake	RMDL/Intake
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	2.530	0.3	2.530	0.3	2.530	0.3	2.530	Crtcom	RMDL/Intake	RMDL/Intake
5	DOC	0.5	mg/L	5.1	57.521	5.1	57.521	4.0	44.668	4.0	44.668	Crtcom	RMDL/Intake	RMDL/Intake
5	TOC	5	mg/L	4	41.438	4	41.438	4	41.438	4	41.438	Crtcom	RMDL/Intake	RMDL/Intake
6	Total phosphorus	0.10	mg/L	0.08	0.902	0.08	0.902	0.08	0.902	0.08	0.902	Crtcom	RMDL/Intake	RMDL/Intake
8	Total suspended solids	5	mg/L	7	76.809	7	76.809	5	55.835	5	55.835	Crtcom	RMDL/Intake	RMDL/Intake
8	Volatile suspended solids	10	mg/L	6	63.469	6	63.469	6	63.469	6	63.469	Crtcom	RMDL/Intake	RMDL/Intake
9	Aluminum	30.0	ug/L	96.8	0.987	96.8	0.987	96.8	0.987	96.8	0.987	Crtcom	RMDL/Intake	RMDL/Intake
9	Boron	50.0	ug/L	32.0	0.331	32.0	0.331	32.0	0.331	32.0	0.331	Crtcom	RMDL/Intake	RMDL/Intake
9	Cadmium	2.0	ug/L	1.3	0.013	1.3	0.013	1.3	0.013	1.3	0.013	Crtcom	RMDL/Intake	RMDL/Intake
9	Chromium	20.0	ug/L	8.5	0.087	8.5	0.087	8.5	0.087	8.5	0.087	Crtcom	RMDL/Intake	RMDL/Intake
9	Copper	10.0	ug/L	7.0	0.074	7.0	0.074	7.0	0.074	7.0	0.074	Crtcom	RMDL/Intake	RMDL/Intake
9	Lead	30.0	ug/L	13.5	0.147	13.5	0.147	13.5	0.147	13.5	0.147	Crtcom	RMDL/Intake	RMDL/Intake
9	Nickel	20.0	ug/L	8.0	0.088	8.0	0.088	8.0	0.088	8.0	0.088	Crtcom	RMDL/Intake	RMDL/Intake
9	Zinc	10.0	ug/L	1410.5	15.923	1410.5	15.923	79.7	0.890	79.7	0.890	Crtcom	RMDL/Intake	RMDL/Intake
10	Antimony	5.0	ug/L	2.0	0.021	2.0	0.021	2.0	0.021	2.0	0.021	Crtcom	RMDL/Intake	RMDL/Intake
11	Chromium (hexavalent)	10.0	ug/L	20.0	0.226	20.0	0.226	20.0	0.226	20.0	0.226	Crtcom	RMDL/Intake	RMDL/Intake
12	Mercury	0.10	ug/L	0.14	0.002	0.14	0.002	0.10	0.002	0.10	0.002	Crtcom	RMDL/Intake	RMDL/Intake
14	Phenolics (4AAP)	2.0	ug/L	3.6	0.037	3.6	0.037	2.2	0.025	2.2	0.025	Crtcom	RMDL/Intake	RMDL/Intake
15	Sulphide	20.0	ug/L	1308.7	14.614	1308.7	14.614	191.9	2.143	191.9	2.143	Crtcom	RMDL/Intake	RMDL/Intake
16	1,2-Dichloroethane	0.8	ug/L	1.1	0.012	1.1	0.012	0.8	0.009	0.8	0.009	Crtcom	RMDL/Intake	RMDL/Intake
16	Chloroform	0.7	ug/L	1.3	0.015	1.3	0.015	1.3	0.015	1.3	0.015	Crtcom	RMDL/Intake	RMDL/Intake
16	Methylene chloride	1.3	ug/L	2.3	0.023	2.3	0.023	1.8	0.020	1.8	0.020	Crtcom	RMDL/Intake	RMDL/Intake
17	Toluene	0.5	ug/L	4.9	0.052	4.9	0.052	0.5	0.006	0.5	0.006	Crtcom	RMDL/Intake	RMDL/Intake
19	Diphenyl ether	0.4	ug/L	0.3	0.003	0.3	0.003	0.3	0.003	0.3	0.003	Crtcom	RMDL/Intake	RMDL/Intake
20	Phenol	2.4	ug/L	0.7	0.007	0.7	0.007	0.7	0.007	0.7	0.007	Crtcom	RMDL/Intake	RMDL/Intake
25	Oil and grease	1.0	mg/L	3.6	36.326	3.6	36.326	1.0	11.167	1.0	11.167	Crtcom	RMDL/Intake	RMDL/Intake

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

DOW CHEMICAL CANADA INC.

1.0 PLANT DESCRIPTION

The Dow Chemical Canada Inc. Sarnia Division plant at Sarnia, Ontario is an integrated organic and inorganic chemicals producer with thirteen separate processing units and ancillary operations. The plant is located on the St. Clair River south of Sarnia. Production at the site was initiated in the 1940's. Most of the existing processing units were built prior to 1960 and updated since that time.

Presently, Dow Chemical is comprised of 13 chemical processing plants, a research laboratory and ancillary operations including a railroad tank car washing station, a power and steam production facility and an end-of-pipe biological wastewater treatment facility. Principal products and intermediates include chlorine and sodium hydroxide; hydrochloric acid (anhydrous and aqueous); ethylene dichloride and vinyl chloride monomer; chlorinated solvents; propylene oxide and propylene oxide derivatives; ethylbenzene, styrene and polystyrene; high and low density polyethylene; styrene/butadiene latexes; and Derakane, a family of epoxy resins.

Process effluents from the propylene oxide and propylene oxide derivatives plants and contaminated water from the propylene oxide derivatives, latex, ethylbenzene/styrene, and high density polyethylene plants are treated in a secondary biological treatment plant consisting of an above-ground equalization basin, an aeration basin, and two clarifiers operated in series. Mixed liquor from the first clarifier can be recycled or wasted, while settled sludge from the second clarifier is usually wasted. The settled sludge is processed in a four-stage countercurrent sludge washing system to remove soluble salts, then dewatered in a filter press and trucked to Dow's LaSalle Road landfill for disposal. The second clarifier overflow is directed to a treated effluent storage pond. A portion (20%) of the effluent is used for solution brine mining and the balance is discharged to the St. Clair River through the 4th Street sewer (MISA Control Point CO 0900).

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

At the time of the site visit, in April, 1991, Dow reported that the Caustic and Chlorine II plants (Plant Numbers 44 and 47) were being permanently shut down. Production had been reduced with termination of all operations expected by July 1991. Accordingly, these plants are not considered in this report. Since

the site visit, Dow has announced the permanent closure of the Solvents and Chlorothene™ units scheduled for sometime in 1992. In addition, there is a probability that all other units connected in any way with chlorine chemistry will also be shut down by 1994 or 1995. This would include the Chloro-Alkali, Vinyl Chloride, and Propylene Oxide units. It would also probably shut down the Biox unit, since production units to be shut down supply the majority of the organic loading to the Biox unit. Although the scheduled closures will certainly affect all production and wastewater generation and management, this report incorporates the plants scheduled for closure. If the scheduled closures become permanent, the BAT Options recommended in this report will have to be re-evaluated.

2.0 WASTEWATER SOURCES AND QUALITY

At present, Dow uses about 818,000 m^3/day of St. Clair River water for cooling and processing purposes. Most cooling water applications are on a once-though basis. The plant has combined sewers for process water, non-contact cooling water (NCCW) and storm water. Effluents are presently discharged from the site through seven combined outfalls. All seven combined discharges were monitored during the MISA Twelve Month Monitoring Period. In addition to the combined sewers, process effluents from individual plants as well as the storm water runoff from Dow's two active landfills were also monitored. Table 1.0 presents the sources of wastewater at all MISA Control Points.

During the site visit, Dow indicated that the plant recently announced a multi-year, multi-million dollar River Separation Project, which has as its overall objective removing the plant from direct contact with the St. Clair River; key components of the project are as follows:

Surface Runoff

Dow will separate NCCW from storm water collected inside the battery limits of each production process. This plan has been completed or is underway for a number of processes. In most cases, separation has or will be accomplished by hard-piping the NCCW from individual heat exchangers to combined storm and NCCW sewers located outside the process area. Collected surface runoff will be tested and either discharged or treated. When completed, this phase of the project will substantially reduce the likelihood of a spill reaching the combined sewers.

For surface runoff outside process battery limits (i.e., "clean" surface runoff), Dow is considering whether, or to what extent, to collect surface runoff for use as make-up to the fresh water system.

NCCW - Spill Risk Assessment

Dow will assess the risk of spills presented by each the 275 water-cooled heat exchangers by ranking them into critical and non-critical applications. Those with the highest risks will be slated for increased preventive maintenance until retrofitted with recirculating cooling water or air cooled exchangers.

TABLE 1.0 SOURCES OF WASTEWATER AT MISA CONTROL POINTS DOW CHEMICAL CANADA INC.		
MISA CONTROL POINT	DESCRIPTION	SOURCES OF WASTEWATER
PR 1200	Throx Stripper Effluent	· Throx stripper effluent from propylene oxide plant directed to CO 0500.
PR 1600	Block 90 Pond Feed	· process wastewater from the tank car wash unit directed to CO 0900.
PR 1700	Block 90 Pond Feed	· process wastewater from the vinyl chloride/chlorothene and solvents plants directed to CO 0900.
PR 1900	Biox Plant Effluent	· process wastewater from the propylene oxide, propylene oxide derivatives, latex, ethylbenzene/styrene, and high density polyethylene plants treated at the Biox unit and discharged at CO 0900.
PR 2000	Boiler Feedwater Effluent	· Regenerants from ion exchangers and sand filter backwash from the steam and power generating facility directed to CO 0900.
PR 2100	Scott Road Landfill Treated Runoff	· Surface runoff and leachate treated with granular activated carbon system and directed to the river.
CO 0200	42 Inch Outfall to River	· Cooling and storm water runoff from propylene oxide plant. · Cooling water from solvents plant. · Cooling water from vinyl chloride/chlorothene plant.
CO 0500	54 Inch Sluice Outfall to River	· Scrubber water from the gas scrubbing column from the Throx unit at the propylene oxide plant (PR 1200). · Cooling water and storm water runoff from the propylene oxide plant. · Storm water runoff from the now shut down caustic and Chlorine II plants.
CO 0600	2nd Street Outfall to River	· Cooling water and storm water runoff from the polystyrene plant. · Cooling water and storm water runoff from the propylene oxide derivatives plant.
CO 0700	3rd Street Outfall to River	· Cooling water and storm water runoff from the ethylbenzene/ styrene plant. · Cooling water and storm water runoff from the high density polyethylene plant. · Cooling water and storm water runoff from the latex plant.
CO 0900	4th Street Outfall to River	· Biological Treatment System (Biox) effluent. · Cooling water and storm water runoff from low density polyethylene plant. · Cooling water and storm water runoff from chloro-alkali plant. · Contaminated wash water and storm water runoff (PR 1600, PR 1700) from the tank car wash plant. · Cooling water and storm water runoff from the ethylbenzene/ styrene plant. · Contaminated process wastewater and storm water runoff from Block 90 pond. · Cooling water and storm water runoff from the epoxy plant. · Backwash from sand filters, from the power generating facility (PR 2100).
OT 0300	48 Inch Outfall to River	· Cooling water and storm water runoff from the vinyl chloride/chlorothene and solvents plants.
OT 1000	5th Street Outfall to River	· Cooling water and storm water runoff from the power generating facility.

Process Wastewater Reduction

The principal objective for the high salt content process wastewater (Biox effluent) is to maximize recycle for solution brine mining, thus displacing river water. The degree of recycle is limited by sulfate build up in the brine circuit and the chemical quality of the Biox effluent (nitrogen, organics). Dow is planning to develop systems to treat and reuse as much contaminated fresh water as possible. However, at the time of the visit, Dow reported these plans were not well-developed.

If fully implemented according to Dow's objectives, the River Separation Project may result in a limited process wastewater discharge, little or no cooling water discharge and the discharge of storm water which should be relatively free of contamination from Dow operations. Although some aspects of this (separation of storm water runoff and cooling water) were underway or completed at the time of the site visit, it is not known what effects the announced closures of parts of the plant will have on this project.

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the analytical results obtained from the MISA OCM Twelve Month Report for Dow's MISA Control Points.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of Environment for the MISA Twelve Month Monitoring Period were not determined to be acutely lethal to Daphnia Magna and/or Rainbow Trout. Based on these results, no additional treatment is recommended for BAT Option 1 for the seven DOW outfalls.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that, if installed, will achieve the maximum overall pollutant reduction. If fully implemented according to Dow's objectives, the River Separation Project should result in a limited process wastewater discharge, little or no cooling water discharge and the discharge of storm water which would be relatively free of contamination from Dow operations. This would be considered BAT for an OCM Sector plant. At the time of the site visit, the separation of cooling water, storm water runoff and process wastestreams aspect of this project was either completed or well underway in most manufacturing areas of the plant.

For the process wastewater, the principal objective is to separate the high salt content process wastewater from the salt-free wastewater sources. Saline process wastewater will be treated in the existing biological treatment system which is uniquely designed to treat high-salt incoming feed. A new wastewater treatment system is recommended to treat salt-free process wastewater. Based on the analytical results obtained from the MISA OCM Sector Twelve Month Report, granular activated carbon followed by multi-media filtration is recommended for the salt-free process wastewaters. It is recommended that the following salt-free wastewater streams be treated at the granular activated carbon multi-media filtration treatment system:

- Process wastewater from Throx stripper effluent (PR 1200)
- Process wastewater from ethylbenzene/styrene plant (PR 1300)
- Process wastewater from the latex plant (PR 1400)
- Process wastewater from the high density polyethylene plant (PR 1500)
- Contact cooling water from the polystyrene plant
- Contact cooling water from the low density polyethylene plant.

Separation and treatment of the non-saline wastestreams will reduce flow and pollutant loadings to the existing biological treatment system (Biox) thus increasing current removal efficiency. Therefore, no additional treatment is recommended for MISA Control Point PR 1900 (Biox effluent) for BAT Option 2.

Based on the analytical results obtained for the MISA OCM Sector Twelve Month Report for process wastewaters from the vinyl chloride/chlorothene™ and Solvents plants (MISA Control Point PR 1700) and

the tank car wash building (MISA Control Point PR 1600), steam stripping is recommended for the control of elevated concentrations of various VOCs in both wastestreams. Steam stripping has been demonstrated to reduce high VOC concentrations to low part per billion (ppb) levels. In addition, neutralization and multi-media filtration are recommended to control pH levels and to reduce the concentration of metals at MISA Control Point 1600 and chemical precipitation and multi-media filtration are recommended to reduce concentrations of metals at MISA Control Point 1700.

After the separation of process, cooling and storm water runoff streams, only non-contact cooling and non-contaminated storm water runoff will flow into the current combined discharge points. Therefore, no additional treatment is recommended for MISA Control Points CO 0200, CO 0500, and CO 0700 for BAT Option 2.

The analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points CO 0600, OT 1000 and PR 2100 showed elevated concentrations of organic pollutants; PR 2100 also showed elevated concentrations for boron and oil and grease. MISA Control Point CO 0900 also showed elevated levels of zinc. Although the reported concentrations of these pollutants are not considered high for a process wastewater, development and implementation of a Best Management Practices (BMP) Plan is recommended to control these pollutants for BAT Option 2. This pollution prevention approach should focus on the identification of the source(s) and implementation of methods of control of these pollutants. A draft report prepared by Environment Canada outlines guidelines for a development and implementation of a Best Management Practices (BMP) Plan (Ref. 2). In addition, oil separation is recommended at MISA Control Point PR 2100 for BAT Option 2.

Finally, the analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 2000 and OT 0300 indicate that the plant's current pollutant discharge levels are as low or lower than the discharge levels for similar organic chemicals manufacturing plants in the U.S. and Canada. Therefore, no additional treatment is recommended for BAT Option 2 at MISA Control Points PR 0200 and OT 0300.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant farthest toward virtual elimination and the ultimate goal of zero discharge of contaminants including current technologies or a combination of current technologies, supplemental/additional technologies or cross-over technologies from other industrial sectors.

Based on the MISA monitoring data and pollutant reduction that will be achieved with the installation of granular activated carbon and multi-media filtration for the salt free wastewater sources, no additional treatment is recommended for MISA Control Points PR 1200, PR 1300, PR 1400 and PR 1500 for BAT Option 3.

Based on the pollutant concentrations found during the MISA Twelve Month Monitoring Period and the pollutant reductions expected to be achieved with the addition of steam stripping for BAT Option 2 at MISA Control Points PR 1600 and PR 1700, granular activated carbon is recommended at MISA Control Points PR 1600, PR 1700 and CO 0200. Multi-media filtration is also recommended at MISA Control Point CO 0200 in addition to granular activated carbon for BAT Option 3. Granular activated carbon will further reduce concentrations of VOCs such as tetrachloroethylene and chloroform and will reduce effluent concentrations of conventional pollutants such as DOC, TOC and COD. The combination of granular activated carbon and multi-media filtration will also reduce octachlorodibenzo-p-dioxin and octachlorodibenzofuran effluent concentrations.

Based on the pollutant concentrations obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 2000 and PR 2100, granular activated carbon and multi-media filtration is recommended to control COD, TSS and phenolics (4AAP) and other VOCs as well as various metals for BAT Option 3.

Based on the analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points CO 0500, CO 0700 and OT 0300, no additional treatment is recommended for BAT Option 3.

Based on the BAT Option 2 and 3 recommendations, no additional treatment is recommended for BAT Option 3 at MISA Control Points CO 0600, CO 0900 and OT 1000 beyond that recommended for BAT Option 2.

Because of the high salt content in the feed to the wastewater treatment plant, the Biox effluent (MISA Control Point PR 1900) contains high total dissolved solids. The average effluent concentration for specific conductance at PR 1900 was 87915 uS/cm.

Treatment methods for TDS include, evaporation, membrane processes (i.e., reverse osmosis) and electrodialysis. Although none of these technologies is currently in use in the OCM Sector, vapor compression distillation with recycle is an evaporative technology that can achieve virtual elimination and

zero discharge of pollutants to receiving waters, while eliminating the discharge of high levels of TDS. However, pollutants are not destroyed, but rather removed as a solid waste.

Vapor compression evaporators have been widely used to concentrate effluents, in the treatment of cooling tower blowdown and other concentrated TDS streams in the electric power generating industry. This process produces a concentrate that can be disposed, or further concentrated by crystallization or spray drying to produce a solid for disposal. The resulting high quality condensate can be reused in the plant as boiler make-up or for other uses, without requiring additional treatment (Ref. 3). In addition, vapor compression distillation and recycle has been recommended as a method of achieving zero discharge by the U.S. EPA for the Iron and Steel Manufacturing Sector (Ref. 4).

Therefore, this technology is recommended for the reduction of TDS at MISA Control Point PR 1900. In addition to TDS reduction, vapor compression distillation will reduce other contaminants present in this wastestream.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the recommended BAT technologies for BAT Options 1, 2 and 3.

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of effluent concentration data for each BAT option is also included in Appendix B.

TABLE 2.0 SUMMARY OF BAT OPTIONS FOR DOW CHEMICAL CANADA INC		
BAT OPTION	DEFINITION	DESCRIPTION
A) MISA CONTROL POINT PR 1200 (Throx Stripper Effluent, Flows into CO 0500)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Granular activated carbon, multi-media filtration
3	Zero Discharge/Virtual Elimination	Same as Option 2
B) MISA CONTROL POINT PR 1600 (Block 90 Feed (Building 88) Flows into CO 0900)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Neutralization, steam stripping and multi-media filtration
3	Zero Discharge/Virtual Elimination	Option 2 plus granular activated carbon
C) MISA CONTROL POINT PR 1700 (Block 90 Feed (Buildings 35 & 39) Flows into CO 0900)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Steam stripping, chemical precipitation and multi-media filtration
3	Zero Discharge/Virtual Elimination	Option 2 plus granular activated carbon
D) MISA CONTROL POINT PR 1900 (Biox Effluent Flows into CO 0900)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Vapor compression distillation and recycle
E) MISA CONTROL POINT PR 2000 (Boiler Feed Water Effluent, Flows into CO 0900)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multi-media filtration
F) MISA CONTROL POINT PR 2100 (Scott Road Treated Runoff to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMPs (organics, boron) and oil separation
3	Zero Discharge/Virtual Elimination	Option 2 plus multi-media filtration and granular activated carbon
G. MISA CONTROL POINT CO 0200 (42 Inch Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multi-media filtration
H. MISA CONTROL POINT CO 0500 (54 Inch Sluice Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR DOW CHEMICAL CANADA INC

BAT OPTION	DEFINITION	DESCRIPTION
I. MISA CONTROL POINT CO 0600 (2nd Street Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMPs (08CDD)
3	Zero Discharge/Virtual Elimination	Same as Option 2
J. MISA CONTROL POINT CO 0700 (3rd Street Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
K. MISA CONTROL POINT CO 0900 (4th Street Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMPs (Zinc)
3	Zero Discharge/Virtual Elimination	Same as Option 2
L. MISA CONTROL POINT OT 0300 (48 Inch Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
M. MISA CONTROL POINT OT 1000 (5th Street Outfall to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMP (organics)
3	Zero Discharge/Virtual Elimination	Same as Option 2
N. MISA CONTROL POINT WA 2200 (LaSalle Road Runoff to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
O. MISA CONTROL POINT WA 2300 (LaSalle Road Runoff to River		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste- specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The cost estimates for vapor compression distillation and recycle were taken from the Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA 440/1-82/024, May 1982 (Ref. 4).

The source of the cost estimates associated with the control technologies considered for Dow Chemical Canada Inc. plant for granular activated carbon multi-media filtration and steam stripping were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibres Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 5).

Table 3.0 presents the cost estimates developed for the technologies considered for each BAT Option for Dow Chemical. Cost estimates for development and implementation of a BMP Plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
DOW CHEMICAL CANADA INC.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
PR 1600	1,256	0	0	NAT	1,258,100 646,500 44,000 1,948,600	566,200 57,900 5,000 629,100	SS FIL NEU TOTAL	1,948,600 1,812,400 3,761,000	629,100 1,462,100 2,091,200	Option 2 GAC TOTAL
PR 1700	1,267	0	0	NA	1,261,100 648,200 745,300 2,654,600	572,700 77,200 90,500 740,400	SS FIL CP TOTAL	2,654,600 1,830,500 4,485,100	740,400 1,480,600 2,221,000	Option 2 GAC TOTAL
PR 2000	1,391	0	0	NAT	0	0	NAT	1,972,700 666,400 2,639,100	1,632,300 59,300 1,691,600	GAC FIL TOTAL
PR 1200 PR 1300 PR 1400 PR 1500	832 174 63 127	0	0	NAT	1,746,300 637,200 2,383,500	1,392,300 57,200 1,449,500	GAC FIL TOTAL	2,383,500	1,449,500	Same as Option 2
PR 1900	10,020	0	0	NAT	0	0	NAT	63,990,800	7,273,300	EVAP
CO 0200	107,500	0	0	NAT	0	0	NAT	94,507,500 5,751,200 100,268,700	9,771,200 254,800 10,026,600	GAC FIL TOTAL
CO 0600	61,489	0	0	NAT	0	0	NAT	0	0	NAT
CO 0700	117,345	0	0	NAT	0	0	NAT	0	0	NAT
CO 0900	635,880	0	0	NAT	0	0	NAT	0	0	NAT
OT 0300	64,666	0	0	NAT	NA	NA	BMP	NA	0	BMP
OT 1000	15,366	0	0	NAT	NA	NA	BMP	NA	NA	BMP
PR 2100	162	0	0	NAT	NA 209,000	NA NA	BMP API	209,000 384,700 426,000 1,019,700	NA 214,600 38,800 253,400	Option 2 GAC FIL TOTAL
WA 2200	---	0	0	NAT	0	0	NAT	0	0	NAT
WA 2300	---	0	0	NAT	0	0	NAT	0	0	NAT

NOTES:
NA - Cost estimates not developed
NAT - No Additional Treatment
BMP - Best Management Practices
SS - Steam Stripping
API - Oil Separation
GAC - Granular Activated Carbon
FIL - Multi-media Filtration
EVAP - Vapor Compression Distillation Recycle
NEU - Neutralization
CP - Chemical Precipitation

6.0 REFERENCES

1. Dow Chemical Canada Inc. BAT Status of the OCM Sector Plants Site Visit Information Report, April 15-17, 1991.

2. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Application to Ontario's MISA Program", May 1987.

3. General Technology Report on Vapour Compression Evaporation for TDS removal.

4. Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (EPA 440/1-82/024, May 1982).

5. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR DOW CHEMICAL CANADA INC.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	PR 2100	CO 0200	CO 0500
1	COD	10	mg/L	8	76	31	53	1723	63	101	6	8
2	Cyanide Total	0.005	mg/L	0.004	0.006	0.005	0.005	0.005	0.005	0.009	0.005	0.005
3	Hydrogen ion (pH)			8.1	7.6	11.0	7.7	7.5	7.9	7.6	8.1	8.2
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.03	0.03	0.04	2.87	0.08	3.67	0.03	0.09
4	Nitrate+Nitrite	0.25	mg/L	0.50	3.89	0.21	0.30	0.03	1.56	0.03	0.28	0.36
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	0.6	0.5	0.7	1.5	1.1	3.0	0.6	1.0
5	DOC	0.5	mg/L	2.1	2.4	5.5	7.7	4.9	3.9	22.4	2.3	2.3
5	TOC	5	mg/L	2	2	5	8	6	4	24	2	2
6	Total phosphorus	0.10	mg/L	0.07	0.07	8.14	0.10	0.29	0.08	0.27	0.07	0.05
7	Specific conductance	5	uS/cm	244	13815	5800	11705	88332	4047	5445	206	882
8	Total suspended solids	5	mg/L	4	8	76	23	34	11	5	6	5
8	Volatile suspended solids	10	mg/L	4	4	22	12	15	4	4	3	3
9	Aluminum	30.0	ug/L	32.8	34.8	184.1	129.9	415.5	68.3	66.2	56.0	102.3
9	Boron	50.0	ug/L	11.0	16.4	28.8	63.5	49.3	27.7	3408.8	9.3	9.5
9	Chromium	20.0	ug/L	3.8	5.8	44.4	11.4	5.9	4.9	11.4	5.8	3.3
9	Copper	10.0	ug/L	3.0	12.2	71.8	24.8	9.9	5.9	5.4	10.3	3.5
9	Lead	30.0	ug/L	24.0	35.0	82.3	73.0	35.0	157.9	24.0	24.0	24.0
9	Molybdenum	20.0	ug/L	18.0	65.4	49.7	67.0	35.9	18.1	25.3	18.0	18.8
9	Nickel	20.0	ug/L	6.0	17.0	86.5	145.4	42.5	7.7	8.1	6.0	6.0
9	Vanadium	30.0	ug/L	16.0	4.1	6.8	4.8	7.5	39.0	42.3	15.5	14.0
9	Zinc	10.0	ug/L	3.0	13.5	129.5	182.8	31.6	6.7	5.4	3.0	3.3
12	Mercury	0.10	ug/L	0.08	0.09	0.13	0.11	0.73	0.09	0.13	0.09	0.13
14	Phenolics (4AAP)	2.0	ug/L	7.3	5.6	2.3	8.1	32.1	20.6	9.7	5.6	7.0
15	Sulphide	20.0	ug/L	47.5	65.0	475.0	40.0	112.5	42.5	62.5	42.5	45.0

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	PR 2100	CO 0200	CO 0500
16	1,1,2,2–Tetrachloroethane	4.3	ug/L	0.8	0.7	0.6	15.9	0.7	0.8	0.7	0.8	0.9
16	1,1,2–Trichloroethane	0.6	ug/L	0.3	0.2	0.2	124.2	0.2	0.3	15.6	0.7	0.4
16	1,1–Dichloroethane	0.8	ug/L	0.3	0.2	0.2	246.5	0.2	0.3	38.7	1.4	0.4
16	1,1–Dichloroethylene	2.8	ug/L	0.5	0.4	3.9	22.0	1.5	0.4	0.4	0.6	0.5
16	1,2–Dichloroethane	0.8	ug/L	0.4	0.5	1.1	1070.0	3.4	0.6	0.6	11.7	0.5
16	1,2–Dichloropropane	0.9	ug/L	0.2	58.4	0.2	38.6	26.8	0.2	5.2	4.8	4.3
16	Bromodichloromethane	0.8	ug/L	0.3	4.5	2.8	2.6	0.3	0.3	0.3	0.3	0.3
16	Bromoform	3.7	ug/L	0.6	6.9	0.6	7.5	0.4	0.5	0.5	0.6	0.6
16	Carbon tetrachloride	1.3	ug/L	1.0	0.9	140.1	15.3	0.9	0.8	0.8	33.4	1.2
16	Chloroform	0.7	ug/L	0.5	2.2	51.1	8.6	0.4	0.4	2.3	1.8	0.7
16	Chloromethane	3.7	ug/L	13.9	1.2	1.4	1.1	1.3	2.2	1.1	8.0	12.7
16	Cis–1,3–Dichloropropylene	1.4	ug/L	0.4	0.5	1.2	4.5	0.5	0.4	0.7	1.1	0.5
16	Dibromochloromethane	1.1	ug/L	0.4	11.3	3.8	7.5	0.4	0.4	6.6	0.5	0.5
16	Methylene chloride	1.3	ug/L	0.5	4.3	3.8	42.2	4.9	0.4	0.3	0.8	0.5
16	Tetrachloroethylene	1.1	ug/L	0.7	0.9	303.8	73.5	1.1	1.1	0.9	40.9	3.1
16	Trichloroethylene	1.9	ug/L	0.4	0.4	0.6	27.6	0.4	0.4	0.4	3.5	0.5
16	Vinyl chloride	4.0	ug/L	2.7	0.7	0.7	47.2	0.7	1.2	0.7	1.5	1.0
17	Benzene	0.5	ug/L	0.3	0.3	0.1	0.1	1.4	0.2	0.2	0.3	0.2
17	Ethylbenzene	0.6	ug/L	0.3	0.5	2.2	0.1	0.8	0.5	0.3	0.3	0.2
17	Styrene	0.5	ug/L	0.4	0.4	0.2	0.1	0.9	0.5	0.3	0.4	0.3
17	m–Xylene and p–Xylene	1.1	ug/L	0.7	0.9	7.1	0.2	1.1	1.0	0.6	0.7	0.5
17	o–Xylene	0.5	ug/L	0.3	0.4	3.0	0.1	0.9	0.5	0.3	0.4	0.3

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	PR 2100	CO 0200	CO 0500
19	2,6–Dinitrotoluene	0.7	ug/L	0.5	0.5	1.0	0.6	0.7	0.9	0.8	1.7	1.1
19	2–Chloronaphthalene	1.8	ug/L	1.5	1.8	1.1	1.5	1.6	1.5	1.5	1.5	1.5
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.1	1.0	0.1	0.1	0.1	0.1	0.1	0.2
19	Biphenyl	0.6	ug/L	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.0
19	Bis(2–chloroethyl)ether	4.4	ug/L	1.4	1.4	375.3	1.4	15.8	1.4	1.4	1.4	1.4
19	Bis(2–chloroisopropyl)ether	2.2	ug/L	1.2	54.7	1.6	5.8	66.6	1.2	2.1	1.2	6.8
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	0.8	0.5	6.2	0.7	0.4	1.4	0.9	0.5	0.7
19	Di–n–butyl phthalate	3.8	ug/L	1.4	1.4	9.3	1.4	1.4	1.5	1.5	1.4	1.4
19	N–Nitrosodi–n–propylamine	3.1	ug/L	0.9	0.9	117.6	1.4	5.1	1.3	0.9	1.0	0.9
19	Naphthalene	1.6	ug/L	1.2	1.5	0.9	1.2	1.3	1.2	1.2	1.2	1.2
20	2,3,4,5–Tetrachlorophenol	0.4	ug/L	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5
20	2,3,4–Trichlorophenol	0.6	ug/L	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5
20	Phenol	2.4	ug/L	2.1	2.4	12.0	2.4	5.3	2.4	2.4	2.4	2.4
23	1,2,4,5–Tetrachlorobenzene	10.0	ng/L	6.5	7.3	1.5	2.0	25.3	7.0	3.2	7.0	7.0
23	1,2,4–Trichlorobenzene	10.0	ng/L	15.8	23.6	1.7	1966.3	9.0	9.0	1667.6	157.3	23.2
23	2,4,5–Trichlorotoluene	10.0	ng/L	8.3	7.7	1.7	856.6	5.3	9.0	397.7	77.9	9.8
23	Hexachlorobenzene	10.0	ng/L	3.5	18.2	165.0	723.3	3.6	7.0	42.8	30.8	8.9
23	Hexachlorobutadiene	10.0	ng/L	7.6	4.3	1.3	82.9	3.0	6.8	416.6	106.1	10.8
23	Hexachlorocyclopentadiene	10.0	ng/L	4.6	5.1	165.9	1.7	3.1	5.0	2.5	5.0	5.0
23	Hexachloroethane	10.0	ng/L	4.8	4.3	4588.2	155.0	3.0	6.3	394.4	96.1	7.9
23	Octachlorostyrene	10.0	ng/L	8.8	7.7	1.7	2.3	5.0	9.0	734.6	15.2	10.3

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	PR 2100	CO 0200	CO 0500
24	Total TCDF	15.0	pg/L	3.4	956.1	1078.3	93.1	104.8	3.8	3.4	3.4	69.2
24	Total PCDD	20.0	pg/L	9.9	54.1	9.9	9.9	9.9	9.9	9.9	9.9	9.9
24	Total PCDF	15.0	pg/L	5.7	2444.7	5.7	407.9	15.1	5.7	5.7	5.7	236.4
24	Total H6CDD	30.0	pg/L	3.0	184.8	3.0	7.7	3.3	3.0	3.0	3.0	3.0
24	Total H6CDF	20.0	pg/L	7.1	5625.7	7.1	941.7	34.7	7.1	7.1	7.1	399.6
24	Total H7CDD	30.0	pg/L	13.2	564.9	13.2	13.2	13.2	13.2	13.2	13.2	46.1
24	Total H7CDF	30.0	pg/L	10.7	9517.1	60.2	1869.0	56.4	48.0	41.0	10.7	251.4
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	22.4	871.5	49.5	226.2	64.5	34.3	45.9	48.1	97.3
24	Octachlorodibenzofuran	30.0	pg/L	27.9	13250.8	567.7	5701.0	140.6	262.0	606.2	27.9	208.0
25	Oil and grease	1.0	mg/L	1.5	1.1	2.1	1.4	4.7	1.3	46.1	1.3	1.2
98	Ftflow		m3/day	–	669	576	1099	8650	1042	130	82887	48783

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0100 – Intake Water to Site
PR 1200 – Throx Stripper Effluent flows into CO 0500
PR 1600 – Tank Car Wash (Building 88) flows into CO 0900
PR 1700 – Block 90 Feed (Buildings 35 & 39) flows into CO 0900
PR 1900 – Biox Plant Effluent flows into CO 0900
PR 2000 – Boiler Feedwater Effluent flows into CO 0900
PR 2100 – Scott Road Treated Runoff to River
CO 0200 – 42 inch Outfall to River
CO 0500 – 54 inch Sluice Outfall to River
CO 0600 – 2nd Street Outfall to River
CO 0700 – 3rd Street Outfall to River
CO 0900 – 4th Street Outfall to River
OT 0300 – 48 inch Outfall to River
OT 1000 – 5th Street Outfall to River
WA 2200 – Lasalle Road Runoff to River
WA 2300 – Lasalle Road Runoff to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300
1	COD	10	mg/L	8	11	19	14	–	–	–	–
2	Cyanide Total	0.005	mg/L	0.004	0.005	0.005	0.005	–	–	–	–
3	Hydrogen ion (pH)			8.1	8.1	8.1	8.1	8.2	8.1	7.6	7.8
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.03	0.03	0.03	–	–	–	–
4	Nitrate+Nitrite	0.25	mg/L	0.50	0.28	0.30	0.29	–	0.32	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	0.5	*0.6	0.5	–	–	–	–
5	DOC	0.5	mg/L	2.1	2.3	2.1	2.4	2.5	2.1	12.0	13.7
5	TOC	5	mg/L	2	2	2	2	2	2	12	14
6	Total phosphorus	0.10	mg/L	0.07	0.06	0.09	0.11	0.06	0.09	0.46	0.35
7	Specific conductance	5	uS/cm	244	213	205	2373	214	213	3471	1981
8	Total suspended solids	5	mg/L	4	7	6	6	4	14	23	15
8	Volatile suspended solids	10	mg/L	4	3	3	3	–	–	7	6
9	Aluminum	30.0	ug/L	32.8	35.0	25.0	58.3	–	–	294.4	359.9
9	Boron	50.0	ug/L	11.0	9.3	9.8	9.5	–	–	85.5	152.1
9	Chromium	20.0	ug/L	3.8	4.5	3.0	6.0	–	–	26.4	6.4
9	Copper	10.0	ug/L	3.0	3.0	3.3	7.0	–	–	9.6	8.5
9	Lead	30.0	ug/L	24.0	24.0	24.0	36.0	–	–	24.0	22.7
9	Molybdenum	20.0	ug/L	18.0	18.3	18.0	124.5	–	–	24.8	20.1
9	Nickel	20.0	ug/L	6.0	6.0	6.0	18.0	–	–	6.2	6.4
9	Vanadium	30.0	ug/L	16.0	16.3	15.8	4.5	–	–	55.5	56.0
9	Zinc	10.0	ug/L	3.0	3.0	3.0	144.8	–	–	23.4	20.9
12	Mercury	0.10	ug/L	0.08	0.09	0.09	0.09	–	0.10	0.12	0.25
14	Phenolics (4AAP)	2.0	ug/L	7.3	4.9	7.1	10.0	6.0	5.6	18.5	7.9
15	Sulphide	20.0	ug/L	47.5	30.0	37.5	35.0	–	–	–	–

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300
16	1,1,2,2–Tetrachloroethane	4.3	ug/L	0.8	0.9	0.8	0.8	0.9	0.8	–	–
16	1,1,2–Trichloroethane	0.6	ug/L	0.3	1.3	0.3	0.3	0.4	0.3	–	–
16	1,1–Dichloroethane	0.8	ug/L	0.3	0.5	0.3	0.3	0.4	0.3	–	–
16	1,1–Dichloroethylene	2.8	ug/L	0.5	0.5	0.5	0.5	0.5	0.5	–	–
16	1,2–Dichloroethane	0.8	ug/L	0.4	8.4	0.6	1.2	0.5	9.0	–	–
16	1,2–Dichloropropane	0.9	ug/L	0.2	6.9	0.3	1.2	0.3	0.8	–	–
16	Bromodichloromethane	0.8	ug/L	0.3	0.3	0.3	0.3	0.3	0.3	–	–
16	Bromoform	3.7	ug/L	0.6	0.6	0.6	0.6	0.6	0.6	–	–
16	Carbon tetrachloride	1.3	ug/L	1.0	1.7	1.5	1.3	1.2	1.3	–	–
16	Chloroform	0.7	ug/L	0.5	0.6	0.6	0.6	0.7	0.8	–	–
16	Chloromethane	3.7	ug/L	13.9	11.8	12.0	10.0	13.8	3.5	–	–
16	Cis–1,3–Dichloropropylene	1.4	ug/L	0.4	0.5	0.5	0.6	0.5	0.5	–	–
16	Dibromochloromethane	1.1	ug/L	0.4	0.5	0.5	0.5	0.5	0.5	–	–
16	Methylene chloride	1.3	ug/L	0.5	3.9	0.5	0.5	0.5	0.4	–	–
16	Tetrachloroethylene	1.1	ug/L	0.7	1.7	0.8	0.8	0.9	3.0	–	–
16	Trichloroethylene	1.9	ug/L	0.4	0.6	0.5	0.5	0.5	0.5	–	–
16	Vinyl chloride	4.0	ug/L	2.7	1.1	2.0	1.7	1.1	1.4	–	–
17	Benzene	0.5	ug/L	0.3	0.4	0.3	1.2	–	0.2	–	–
17	Ethylbenzene	0.6	ug/L	0.3	0.4	0.5	3.7	–	0.4	–	–
17	Styrene	0.5	ug/L	0.4	0.4	0.5	0.7	–	0.4	–	–
17	m–Xylene and p–Xylene	1.1	ug/L	0.7	0.7	0.8	0.7	–	0.7	–	–
17	o–Xylene	0.5	ug/L	0.3	0.4	0.4	0.4	–	0.4	–	–

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300
19	2,6–Dinitrotoluene	0.7	ug/L	0.5	0.7	2.0	1.2	–	–	–	–
19	2–Chloronaphthalene	1.8	ug/L	1.5	1.5	1.5	1.5	–	–	–	–
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.1	0.1	0.1	–	–	–	–
19	Biphenyl	0.6	ug/L	1.0	1.0	1.0	1.0	–	–	–	–
19	Bis(2–chloroethyl)ether	4.4	ug/L	1.4	1.4	1.4	1.4	–	–	–	–
19	Bis(2–chloroisopropyl)ether	2.2	ug/L	1.2	2.2	1.2	3.1	–	–	–	–
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	0.8	1.0	0.6	0.3	–	–	–	–
19	Di–n–butyl phthalate	3.8	ug/L	1.4	2.2	1.4	1.4	–	–	–	–
19	N–Nitrosodi–n–propylamine	3.1	ug/L	0.9	0.9	0.9	0.9	–	–	–	–
19	Naphthalene	1.6	ug/L	1.2	1.2	1.2	1.2	–	–	–	–
20	2,3,4,5–Tetrachlorophenol	0.4	ug/L	0.4	0.5	0.5	0.5	–	0.4	–	–
20	2,3,4–Trichlorophenol	0.6	ug/L	0.4	0.5	0.5	0.5	–	0.2	–	–
20	Phenol	2.4	ug/L	2.1	2.4	2.4	2.6	–	2.4	–	–
23	1,2,4,5–Tetrachlorobenzene	10.0	ng/L	6.5	7.0	7.0	7.0	7.0	–	–	–
23	1,2,4–Trichlorobenzene	10.0	ng/L	15.8	30.6	13.3	14.1	17.9	–	–	–
23	2,4,5–Trichlorotoluene	10.0	ng/L	8.3	10.3	9.0	12.8	9.2	–	–	–
23	Hexachlorobenzene	10.0	ng/L	3.5	3.9	3.6	3.2	7.9	–	–	–
23	Hexachlorobutadiene	10.0	ng/L	7.6	16.8	6.2	6.5	12.2	–	–	–
23	Hexachlorocyclopentadiene	10.0	ng/L	4.6	5.0	5.0	5.5	5.0	–	–	–
23	Hexachloroethane	10.0	ng/L	4.8	6.8	5.2	6.1	6.5	–	–	–
23	Octachlorostyrene	10.0	ng/L	8.8	9.7	11.4	9.4	9.2	–	–	–

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300
24	Total TCDF	15.0	pg/L	3.4	3.4	3.4	3.4	–	–	–	–
24	Total PCDD	20.0	pg/L	9.9	9.9	9.9	9.9	–	–	–	–
24	Total PCDF	15.0	pg/L	5.7	5.7	5.7	5.7	–	–	–	–
24	Total H6CDD	30.0	pg/L	3.0	3.0	3.0	3.0	–	–	–	–
24	Total H6CDF	20.0	pg/L	7.1	7.1	7.1	7.1	–	–	–	–
24	Total H7CDD	30.0	pg/L	13.2	13.2	13.2	13.2	–	–	–	–
24	Total H7CDF	30.0	pg/L	10.7	10.7	10.7	10.7	–	–	–	–
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	22.4	122.2	22.4	22.4	–	–	–	–
24	Octachlorodibenzofuran	30.0	pg/L	27.9	27.9	27.9	27.9	–	–	–	–
25	Oil and grease	1.0	mg/L	1.5	1.2	1.1	1.1	1.9	1.1	1.1	1.6
98	Ftflow		m3/day	–	53872	102070	566351	60422	13238	**	**
98	Volume Discharged – Total		m3	**	**	**	**	**	**	3993	1486

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) "***" parameter does not pertain to this stream
(iii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iv) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0100 – Intake Water to Site
PR 1200 – Throx Stripper Effluent flows into CO 0500
PR 1600 – Tank Car Wash (Building 88) flows into CO 0900
PR 1700 – Block 90 Feed (Buildings 35 & 39) flows into CO 0900
PR 1900 – Biox Plant Effluent flows into CO 0900
PR 2000 – Boiler Feedwater Effluent flows into CO 0900
PR 2100 – Scott Road Treated Runoff to River
CO 0200 – 42 inch Outfall to River

CO 0500 – 54 inch Sluice Outfall to River
CO 0600 – 2nd Street Outfall to River
CO 0700 – 3rd Street Outfall to River
CO 0900 – 4th Street Outfall to River
OT 0300 – 48 inch Outfall to River
OT 1000 – 5th Street Outfall to River
WA 2200 – Lasalle Road Runoff to River
WA 2300 – Lasalle Road Runoff to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	PR 2100	CO 0200	CO 0500
1	COD	7340.385	44.131	10.838	60.713	13958.067	73.492	13.384	462.368	468.946
2	Cyanide Total	3.711	0.003	0.002	0.006	0.044	0.005	0.001	0.372	0.273
4	Ammonia plus Ammonium	23.194	0.015	0.011	0.047	28.263	0.084	0.326	1.859	2.364
4	Nitrate+Nitrite	463.877	3.570	0.093	0.330	0.283	1.790	0.004	20.611	16.557
4	Total Kjeldahl Nitrogen	347.908	0.338	0.194	0.835	13.118	1.220	0.294	40.189	34.041
5	DOC	1960.343	1.634	2.957	8.437	43.551	4.171	2.912	184.700	107.254
5	TOC	1858.290	1.566	3.036	8.498	50.461	4.123	3.159	166.532	100.536
6	Total phosphorus	64.943	0.047	1.679	0.116	2.645	0.079	0.024	4.584	2.244
8	Total suspended solids	3813.994	6.752	45.573	24.649	303.627	12.534	0.643	408.427	221.676
8	Volatile suspended solids	4052.427	2.220	8.305	13.105	127.542	3.743	0.497	223.150	163.567
9	Aluminum	30.384	0.025	0.236	0.147	3.666	0.078	0.007	3.588	4.848
9	Boron	10.205	0.011	0.014	0.071	0.365	0.031	0.395	0.688	0.515
9	Chromium	3.479	0.004	0.027	0.013	0.052	0.006	0.002	0.526	0.174
9	Copper	2.783	0.008	0.080	0.028	0.089	0.007	*	1.020	0.185
9	Lead	22.266	0.024	0.131	0.088	0.304	0.195	0.003	1.785	1.308
9	Molybdenum	16.700	0.038	0.025	0.076	0.298	0.019	0.002	1.507	1.323
9	Nickel	5.567	0.012	0.056	0.169	0.373	0.009	0.001	0.446	0.327
9	Vanadium	14.844	0.003	0.005	0.005	0.065	0.044	0.006	1.124	0.875
9	Zinc	2.783	0.009	0.242	0.222	0.257	0.007	0.001	0.223	0.167
12	Mercury	0.076	*	*	*	0.005	*	*	0.007	0.006
14	Phenolics (4AAP)	6.776	0.004	0.001	0.009	0.297	0.024	0.001	0.377	0.266
15	Sulphide	44.068	0.038	0.181	0.046	0.987	0.047	0.004	3.035	1.770

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT

TWELVE MONTH AVERAGE LOADING VALUES (kg/day)

PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	ᴾR 2100	CO 0200	CO 0500
16	1,1,2,2–Tetrachloroethane	0.737	*	*	0.018	0.006	0.001	*	0.070	0.042
16	1,1,2–Trichloroethane	0.283	*	*	0.138	0.002	*	0.002	0.053	0.018
16	1,1–Dichloroethane	0.285	*	*	0.280	0.002	*	0.005	0.108	0.018
16	1,1–Dichloroethylene	0.439	*	0.007	0.025	0.013	*	*	0.050	0.026
16	1,2–Dichloroethane	0.408	*	*	1.155	0.030	*	*	0.962	0.025
16	1,2–Dichloropropane	0.231	0.033	*	0.046	0.215	*	0.001	0.334	0.203
16	Bromodichloromethane	0.262	0.002	0.002	0.002	0.003	*	*	0.024	0.014
16	Bromoform	0.521	0.004	*	0.009	0.004	*	*	0.047	0.031
16	Carbon tetrachloride	0.968	*	0.091	0.017	0.008	0.001	*	2.728	0.059
16	Chloroform	0.500	0.001	0.027	0.010	0.003	*	*	0.146	0.033
16	Chloromethane	12.935	0.001	*	0.001	0.011	0.002	*	0.582	0.494
16	Cis–1,3–Dichloropropylene	0.405	*	*	0.005	0.004	0.001	*	0.079	0.023
16	Dibromochloromethane	0.379	0.007	0.003	0.009	0.003	*	0.001	0.036	0.023
16	Methylene chloride	0.435	0.002	0.001	0.048	0.039	*	*	0.072	0.022
16	Tetrachloroethylene	0.695	0.001	0.154	0.082	0.010	0.001	*	3.291	0.123
16	Trichloroethylene	0.409	*	*	0.030	0.004	0.001	*	0.283	0.023
16	Vinyl chloride	2.474	*	*	0.058	0.006	0.001	*	0.112	0.050
17	Benzene	0.314	*	*	*	0.013	*	*	0.017	0.011
17	Ethylbenzene	0.299	*	0.001	*	0.008	*	*	0.022	0.011
17	Styrene	0.326	*	*	*	0.008	*	*	0.026	0.016
17	m–Xylene and p–Xylene	0.620	0.001	0.003	*	0.009	0.001	*	0.048	0.027
17	o–Xylene	0.321	*	0.001	*	0.008	*	*	0.026	0.016
19	2,6–Dinitrotoluene	0.464	*	*	0.001	0.006	0.001	*	0.091	0.035
19	2–Chloronaphthalene	1.392	0.001	*	0.001	0.015	0.002	*	0.093	0.048
19	Benzylbutylphthalate	0.093	*	*	*	0.001	*	*	0.008	0.009
19	Biphenyl	0.928	0.001	*	0.001	0.009	0.001	*	0.074	0.055
19	Bis(2–chloroethyl)ether	1.299	0.001	0.088	0.002	0.138	0.002	*	0.104	0.076
19	Bis(2–chloroisopropyl)ether	1.113	0.031	0.001	0.007	0.564	0.001	*	0.089	0.149
19	Bis(2–ethylhexyl) phthalate	0.742	*	0.001	0.001	0.003	0.002	*	0.030	0.030
19	Di–n–butyl phthalate	1.299	0.001	0.002	0.002	0.012	0.002	*	0.104	0.076
19	N–Nitrosodi–n–propylamine	0.835	0.001	0.024	0.001	0.045	0.001	*	0.073	0.049
19	Naphthalene	1.113	0.001	*	0.001	0.012	0.001	*	0.075	0.039

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	IN 0100	PR 1200	PR 1600	PR 1700	PR 1900	PR 2000	PR 2100	CO 0200	CO 0500
20	2,3,4,5–Tetrachlorophenol	0.375	*	*	*	0.004	0.001	*	0.033	0.023
20	2,3,4–Trichlorophenol	0.395	*	*	0.001	0.005	0.001	*	0.030	0.018
20	Phenol	1.989	0.002	0.003	0.003	0.044	0.003	*	0.178	0.131
23	1,2,4,5–Tetrachlorobenzene	0.006	*	*	*	*	*	*	0.001	*
23	1,2,4–Trichlorobenzene	0.015	*	*	0.002	*	*	*	0.012	0.001
23	2,4,5–Trichlorotoluene	0.008	*	*	0.001	*	*	*	0.006	*
23	Hexachlorobenzene	0.003	*	*	0.001	*	*	*	0.002	*
23	Hexachlorobutadiene	0.007	*	*	*	*	*	*	0.009	*
23	Hexachlorocyclopentadiene	0.004	*	*	*	*	*	*	*	*
23	Hexachloroethane	0.004	*	0.002	*	*	*	*	0.007	*
23	Octachlorostyrene	0.008	*	*	*	*	*	*	0.001	*
24	Total TCDF	*	*	*	*	*	*	*	*	*
24	Total PCDD	*	*	*	*	*	*	*	*	*
24	Total PCDF	*	*	*	*	*	*	*	*	*
24	Total H6CDD	*	*	*	*	*	*	*	*	*
24	Total H6CDF	*	*	*	*	*	*	*	*	*
24	Total H7CDD	*	*	*	*	*	*	*	*	*
24	Total H7CDF	*	*	*	*	*	*	*	*	*
24	Octachlorodibenzo–p–dioxin	*	*	*	*	*	*	*	*	*
24	Octachlorodibenzofuran	*	*	*	*	*	*	*	*	*
25	Oil and grease	1402.763	0.757	1.054	1.573	37.932	1.513	5.890	104.557	60.525

EXPLANATORY NOTES:
(i) "–" not required in the regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0100 – Intake Water to Site
PR 1200 – Throx Stripper Effluent flows into CO 0500
PR 1600 – Tank Car Wash (Building 88) flows into CO 0900
PR 1700 – Block 90 Feed (Building 35 & 39) flow into CO 0900
PR 1900 – Biox Plant Effluent flows onto CO 0900
PR 2000 – Boiler Feedwater Effluent flows into CO 0900
PR 2100 – Scott Road Treated Runoff to River
CO 0200 – 42 inch Outfall to River
CO 0500 – 54 inch Sluice Outfall to River
CO 0600 – 2nd Street Outfall to River
CO 0700 – 3rd Street Outfall to River
CO 0900 – 4th Street Outfall to River
OT 0300 – 48 inch Outfall to River
OT 1000 – 5th Street Outfall to River
WA 2200 – Lasalle Road Runoff to River
WA 2300 – Lasalle Road Runoff to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300	TOTAL
1	COD	7340.385	597.413	2162.768	7817.566	–	–	–	–	11522.445
2	Cyanide Total	3.711	0.272	0.508	2.819	–	–	–	–	4.245
4	Ammonia plus Ammonium	23.194	1.357	2.967	14.925	–	–	–	–	23.798
4	Nitrate+Nitrite	463.877	14.915	31.027	166.127	–	4.258	–	–	253.499
4	Total Kjeldahl Nitrogen	347.908	28.797	65.727	310.500	–	–	–	–	479.548
5	DOC	1960.343	122.221	218.951	1338.542	150.995	27.238	51.822	20.149	2224.784
5	TOC	1858.290	117.557	204.857	1284.578	111.293	25.634	52.589	20.495	2087.230
6	Total phosphorus	64.943	3.500	9.020	67.888	3.680	1.109	0.780	0.771	93.600
8	Total suspended solids	3813.994	368.549	579.511	3043.319	246.038	171.326	167.629	22.568	5229.686
8	Volatile suspended solids	4052.427	162.890	305.549	1726.448	–	–	39.950	8.572	2630.623
9	Aluminum	30.384	1.975	2.561	35.518	–	–	1.600	0.546	50.643
9	Boron	10.205	0.501	0.989	5.495	–	–	0.212	0.193	8.988
9	Chromium	3.479	0.260	0.306	3.453	–	–	0.249	0.010	4.980
9	Copper	2.783	0.163	0.336	4.028	–	–	0.035	0.012	5.779
9	Lead	22.266	1.303	2.445	20.717	–	–	0.096	0.035	27.692
9	Molybdenum	16.700	0.944	1.704	57.634	–	–	0.089	0.033	63.236
9	Nickel	5.567	0.326	0.611	10.358	–	–	0.024	0.010	12.103
9	Vanadium	14.844	0.880	1.601	2.599	–	–	0.192	0.089	7.366
9	Zinc	2.783	0.163	0.306	91.421	–	–	0.048	0.036	92.365
12	Mercury	0.076	0.005	0.009	0.052	–	0.001	*	*	0.080
14	Phenolics (4AAP)	6.776	0.274	0.702	5.580	0.368	0.073	0.070	0.012	7.723
15	Sulphide	44.068	1.671	4.022	20.802	–	–	–	–	31.304

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300	TOTAL
16	1,1,2,2–Tetrachloroethane	0.737	0.047	0.085	0.471	0.051	0.011	–	–	0.777
16	1,1,2–Trichloroethane	0.283	0.065	0.034	0.189	0.021	0.004	–	–	0.386
16	1,1–Dichloroethane	0.285	0.029	0.034	0.189	0.021	0.004	–	–	0.408
16	1,1–Dichloroethylene	0.439	0.029	0.052	0.284	0.033	0.006	–	–	0.480
16	1,2–Dichloroethane	0.408	0.443	0.055	0.693	0.027	0.114	–	–	2.319
16	1,2–Dichloropropane	0.231	0.371	0.027	0.563	0.017	0.012	–	–	1.528
16	Bromodichloromethane	0.262	0.016	0.031	0.169	0.019	0.004	–	–	0.277
16	Bromoform	0.521	0.034	0.061	0.335	0.037	0.008	–	–	0.553
16	Carbon tetrachloride	0.968	0.088	0.151	0.690	0.073	0.017	–	–	3.806
16	Chloroform	0.500	0.035	0.063	0.343	0.039	0.010	–	–	0.669
16	Chloromethane	12.935	0.669	1.344	5.945	0.783	0.042	–	–	9.859
16	Cis–1,3–Dichloropropylene	0.405	0.026	0.048	0.349	0.029	0.006	–	–	0.560
16	Dibromochloromethane	0.379	0.026	0.046	0.257	0.029	0.006	–	–	0.424
16	Methylene chloride	0.435	0.220	0.048	0.283	0.027	0.006	–	–	0.678
16	Tetrachloroethylene	0.695	0.094	0.077	0.451	0.053	0.039	–	–	4.128
16	Trichloroethylene	0.409	0.030	0.048	0.264	0.029	0.006	–	–	0.683
16	Vinyl chloride	2.474	0.058	0.203	0.985	0.068	0.018	–	–	1.494
17	Benzene	0.314	0.024	0.030	0.730	–	0.003	–	–	0.815
17	Ethylbenzene	0.299	0.021	0.057	2.331	–	0.005	–	–	2.447
17	Styrene	0.326	0.019	0.049	0.387	–	0.005	–	–	0.502
17	m–Xylene and p–Xylene	0.620	0.035	0.076	0.390	–	0.009	–	–	0.585
17	o–Xylene	0.321	0.019	0.037	0.210	–	0.005	–	–	0.313
19	2,6–Dinitrotoluene	0.464	0.039	0.232	0.731	–	–	–	–	1.128
19	2–Chloronaphthalene	1.392	0.087	0.167	0.912	–	–	–	–	1.307
19	Benzylbutylphthalate	0.093	0.007	0.012	0.057	–	–	–	–	0.093
19	Biphenyl	0.928	0.054	0.102	0.575	–	–	–	–	0.860
19	Bis(2–chloroethyl)ether	1.299	0.076	0.143	0.806	–	–	–	–	1.205
19	Bis(2–chloroisopropyl)ether	1.113	0.117	0.122	1.894	–	–	–	–	2.371
19	Bis(2–ethylhexyl) phthalate	0.742	0.064	0.063	0.203	–	–	–	–	0.390
19	Di–n–butyl phthalate	1.299	0.129	0.143	0.806	–	–	–	–	1.258
19	N–Nitrosodi–n–propylamine	0.835	0.049	0.092	0.518	–	–	–	–	0.781
19	Naphthalene	1.113	0.069	0.133	0.728	–	–	–	–	1.044

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DOW CHEMICAL CANADA INC. – SARNIA

ATG	PARAMETER	IN 0100	CO 0600	CO 0700	CO 0900	OT 0300	OT 1000	WA 2200	WA 2300	TOTAL
20	2,3,4,5–Tetrachlorophenol	0.375	0.024	0.047	0.259	–	0.005	–	–	0.391
20	2,3,4–Trichlorophenol	0.395	0.025	0.055	0.301	–	0.003	–	–	0.432
20	Phenol	1.989	0.130	0.240	1.462	–	0.031	–	–	2.172
23	1,2,4,5–Tetrachlorobenzene	0.006	*	0.001	0.004	*	–	–	–	0.006
23	1,2,4–Trichlorobenzene	0.015	0.002	0.001	0.008	0.001	–	–	–	0.025
23	2,4,5–Trichlorotoluene	0.008	0.001	0.001	0.007	0.001	–	–	–	0.016
23	Hexachlorobenzene	0.003	*	*	0.002	*	–	–	–	0.004
23	Hexachlorobutadiene	0.007	0.001	0.001	0.004	*	–	–	–	0.015
23	Hexachlorocyclopentadiene	0.004	*	*	0.003	*	–	–	–	0.003
23	Hexachloroethane	0.004	*	*	0.003	*	–	–	–	0.010
23	Octachlorostyrene	0.008	*	0.001	0.005	0.001	–	–	–	0.008
24	Total TCDF	*	*	*	*	–	–	–	–	*
24	Total PCDD	*	*	*	*	–	–	–	–	*
24	Total PCDF	*	*	*	*	–	–	–	–	*
24	Total H6CDD	*	*	*	*	–	–	–	–	*
24	Total H6CDF	*	*	*	*	–	–	–	–	*
24	Total H7CDD	*	*	*	*	–	–	–	–	*
24	Total H7CDF	*	*	*	*	–	–	–	–	*
24	Octachlorodibenzo–p–dioxin	*	*	*	*	–	–	–	–	*
24	Octachlorodibenzofuran	*	*	*	*	–	–	–	–	*
25	Oil and grease	1402.763	65.155	118.816	631.542	108.017	13.878	4.452	2.777	1115.609

EXPLANATORY NOTES:
(i) "–" not required in the regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0100 – Intake Water to Site
PR 1200 – Throx Stripper Effluent flows into CO 0500
PR 1600 – Tank Car Wash (Building 88) flows into CO 0900
PR 1700 – Block 90 Feed (Building 35 & 39) flow into CO 0900
PR 1900 – Biox Plant Effluent flows onto CO 0900
PR 2000 – Boiler Feedwater Effluent flows into CO 0900
PR 2100 – Scott Road Treated Runoff to River
CO 0200 – 42 inch Outfall to River

CO 0500 – 54 inch Sluice Outfall to Riyer
CO 0600 – 2nd Street Outfall to River
CO 0700 – 3rd Street Outfall to River
CO 0900 – 4th Street Outfall to River
OT 0300 – 48 inch Outfall to River
OT 1000 – 5th Street Outfall to River
WA 2200 – Lasalle Road Runoff to River
WA 2300 – Lasalle Road Runoff to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
DOW CHEMICAL CANADA INC.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 1200 - Throx Stripper Effluent flows into CO 0500
AVERAGE FLOWRATE = 669 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	76	44.131	76	44.131	31	20.739	31	20.739	DowS	Esso	Esso
2	Cyanide Total	0.005	mg/L	0.006	0.003	0.006	0.003	0.006	0.003	0.006	0.003	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.015	0.03	0.015	0.03	0.015	0.03	0.015	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	3.89	3.570	3.89	3.570	3.89	3.570	3.89	3.570	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	0.338	0.6	0.338	0.6	0.338	0.6	0.338	DowS	DowS	DowS
5	DOC	0.5	mg/L	2.4	1.634	2.4	1.634	2.4	1.634	2.4	1.634	DowS	DowS	DowS
5	TOC	5	mg/L	2	1.566	2	1.566	2	1.566	2	1.566	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.07	0.047	0.07	0.047	0.07	0.047	0.07	0.047	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	8	6.752	8	6.752	5	3.345	5	3.345	DowS	P1774	P1774
8	Volatile suspended solids	10	mg/L	4	2.220	4	2.220	4	2.220	4	2.220	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	34.8	0.025	34.8	0.025	34.8	0.025	34.8	0.025	DowS	DowS	DowS
9	Boron	50.0	ug/L	16.4	0.011	16.4	0.011	16.4	0.011	16.4	0.011	DowS	DowS	DowS
9	Chromium	20.0	ug/L	5.8	0.004	5.8	0.004	5.8	0.004	5.8	0.004	DowS	DowS	DowS
9	Copper	10.0	ug/L	12.2	0.008	12.2	0.008	12.2	0.008	12.2	0.008	DowS	DowS	DowS
9	Lead	30.0	ug/L	35.0	0.024	35.0	0.024	35.0	0.024	35.0	0.024	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	65.4	0.038	65.4	0.038	65.4	0.038	65.4	0.038	DowS	DowS	DowS
9	Nickel	20.0	ug/L	17.0	0.012	17.0	0.012	17.0	0.012	17.0	0.012	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	4.1	0.003	4.1	0.003	4.1	0.003	4.1	0.003	DowS	DowS	DowS
9	Zinc	10.0	ug/L	13.5	0.009	13.5	0.009	13.5	0.009	13.5	0.009	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.09	*	0.09	*	0.09	*	0.09	*	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	5.6	0.004	5.6	0.004	2.5	0.002	2.5	0.002	DowS	Esso	Esso
15	Sulphide	20.0	ug/L	65.0	0.038	65.0	0.038	65.0	0.038	65.0	0.038	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	58.4	0.033	58.4	0.033	58.4	0.033	58.4	0.033	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	4.5	0.002	4.5	0.002	0.4	*	0.4	*	DowS	Esso	Esso
16	Bromoform	3.7	ug/L	6.9	0.004	6.9	0.004	6.9	0.004	6.9	0.004	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	0.9	*	0.9	*	0.9	*	0.9	*	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	2.2	0.001	2.2	0.001	1.2	0.001	1.2	0.001	DowS	Esso	Esso
16	Chloromethane	3.7	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	11.3	0.007	11.3	0.007	11.3	0.007	11.3	0.007	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	4.3	0.002	4.3	0.002	4.3	0.002	4.3	0.002	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	0.9	0.001	0.9	0.001	0.9	0.001	0.9	0.001	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 1200 - Throx Stripper Effluent flows into CO 0500
AVERAGE FLOWRATE = 669 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.9	0.001	0.9	0.001	0.9	0.001	0.9	0.001	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.8	0.001	1.8	0.001	1.8	0.001	1.8	0.001	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.001	1.4	0.001	1.4	0.001	1.4	0.001	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	54.7	0.031	54.7	0.031	10.0	0.007	10.0	0.007	DowS	RREL	RREL
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.001	1.4	0.001	1.4	0.001	1.4	0.001	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	0.9	0.001	0.9	0.001	0.9	0.001	0.9	0.001	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.5	0.001	1.5	0.001	1.5	0.001	1.5	0.001	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.002	2.4	0.002	2.4	0.002	2.4	0.002	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.3	*	7.3	*	7.3	*	7.3	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	23.6	*	23.6	*	23.6	*	23.6	*	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	7.7	*	7.7	*	7.7	*	7.7	*	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	18.2	*	18.2	*	18.2	*	18.2	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	4.3	*	4.3	*	4.3	*	4.3	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.1	*	5.1	*	5.1	*	5.1	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	4.3	*	4.3	*	4.3	*	4.3	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	7.7	*	7.7	*	7.7	*	7.7	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	956.1	*	956.1	*	956.1	*	956.1	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	54.1	*	54.1	*	54.1	*	54.1	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	2444.7	*	2444.7	*	2444.7	*	2444.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	184.8	*	184.8	*	184.8	*	184.8	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	5625.7	*	5625.7	*	5625.7	*	5625.7	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	564.9	*	564.9	*	564.9	*	564.9	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	9517.1	*	9517.1	*	9517.1	*	9517.1	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	871.5	*	871.5	*	871.5	*	871.5	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	13250.8	*	13250.8	*	13250.8	*	13250.8	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.1	0.757	1.1	0.757	1.1	0.757	1.1	0.757	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 1600 - Block 90 Feed (Building 88) flows into CO 0900
AVERAGE FLOWRATE = 576 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	31	10.838	31	10.838	31	10.838	31	10.838	DowS	DowS	DowS
2	Cyanide Total	0.005	mg/L	0.005	0.002	0.005	0.002	0.005	0.002	0.005	0.002	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.011	0.03	0.011	0.03	0.011	0.03	0.011	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.21	0.093	0.21	0.093	0.21	0.093	0.21	0.093	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	0.194	0.5	0.194	0.5	0.194	0.5	0.194	DowS	DowS	DowS
5	DOC	0.5	mg/L	5.5	2.957	5.5	2.957	5.5	2.957	4.4	2.534	DowS	DowS	Esso
5	TOC	5	mg/L	5	3.036	5	3.036	5	3.036	5	3.036	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	8.14	1.679	8.14	1.679	8.14	1.679	8.14	1.679	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	76	45.573	76	45.573	5	2.880	5	2.880	DowS	P1774	P1774
8	Volatile suspended solids	10	mg/L	22	8.305	22	8.305	5	2.880	5	2.880	DowS	P1774	P1774
9	Aluminum	30.0	ug/L	184.1	0.236	184.1	0.236	47.0	0.027	47.0	0.027	DowS	RREL	RREL
9	Boron	50.0	ug/L	28.8	0.014	28.8	0.014	28.8	0.014	28.8	0.014	DowS	DowS	DowS
9	Chromium	20.0	ug/L	44.4	0.027	44.4	0.027	17.0	0.010	17.0	0.010	DowS	RREL	RREL
9	Copper	10.0	ug/L	71.8	0.080	71.8	0.080	71.8	0.080	20.0	0.012	DowS	DowS	RREL
9	Lead	30.0	ug/L	82.3	0.131	82.3	0.131	82.3	0.131	82.3	0.047	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	49.7	0.025	49.7	0.025	49.7	0.025	49.7	0.025	DowS	DowS	DowS
9	Nickel	20.0	ug/L	86.5	0.056	86.5	0.056	86.5	0.056	86.5	0.050	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	6.8	0.005	6.8	0.005	6.8	0.005	6.8	0.005	DowS	DowS	DowS
9	Zinc	10.0	ug/L	129.5	0.242	129.5	0.242	42.0	0.024	42.0	0.024	DowS	RREL	RREL
12	Mercury	0.10	ug/L	0.13	*	0.13	*	0.13	*	0.13	*	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	2.3	0.001	2.3	0.001	2.3	0.001	2.3	0.001	DowS	DowS	DowS
15	Sulphide	20.0	ug/L	475.0	0.181	475.0	0.181	200.0	0.115	200.0	0.115	DowS	Petref	Petref
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	3.9	0.007	3.9	0.007	3.9	0.007	3.9	0.007	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	2.8	0.002	2.8	0.002	2.8	0.002	2.8	0.002	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	140.1	0.091	140.1	0.091	7.0	0.004	7.0	0.004	DowS	RREL	RREL
16	Chloroform	0.7	ug/L	51.1	0.027	51.1	0.027	ND(10)	0.006	1.2	*	DowS	P415	Esso
16	Chloromethane	3.7	ug/L	1.4	*	1.4	*	1.4	*	1.4	*	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	3.8	0.003	3.8	0.003	3.8	0.003	3.8	0.003	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	3.8	0.001	3.8	0.001	3.8	0.001	3.8	0.001	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	303.8	0.154	303.8	0.154	18.4	0.011	2.1	0.001	DowS	P913	Esso
16	Trichloroethylene	1.9	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC - SARNIA

PR 1600 - Block 90 Feed (Building 88) flows into CO 0900
AVERAGE FLOWRATE = 576 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4 0	ug/L	0 7	*	0.7	*	0.7	*	0 7	*	DowS	DowS	DowS
17	Benzene	0 5	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	2 2	0.001	2 2	0.001	2.2	0.001	2 2	0.001	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	7.1	0.003	7.1	0.003	7.1	0.003	5 0	0.003	DowS	DowS	Esso
17	o-Xylene	0.5	ug/L	3.0	0.001	3.0	0.001	3.0	0.001	2.6	0.001	DowS	DowS	Esso
19	2,6-Dinitrotoluene	0.7	ug/L	1.0	*	1.0	*	1.0	*	1.0	*	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	1.0	*	1.0	*	1.0	*	1 0	*	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	*	1.0	*	1.0	*	1.0	*	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	375.3	0.088	375.3	0.088	375.3	0.088	10.0	0.006	DowS	DowS	RREL
19	Bis(2-chloroisopropyl)ether	2 2	ug/L	1.6	0.001	1.6	0.001	1.6	0.001	1.6	0.001	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	6.2	0.001	6.2	0.001	6.2	0.001	6.2	0.001	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	9.3	0.002	9.3	0.002	9.3	0.002	9.3	0.002	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	117.6	0.024	117.6	0.024	117.6	0.024	23.0	0.013	DowS	DowS	RREL
19	Naphthalene	1.6	ug/L	0.9	*	0.9	*	0.9	*	0.9	*	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.4	*	0.4	*	0.4	*	0 4	*	DowS	DowS	DowS
20	Phenol	2.4	ug/L	12 0	0.003	12.0	0.003	12.0	0.003	12.0	0.003	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	1.5	*	1.5	*	1.5	*	1.5	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	165.0	*	165.0	*	165.0	*	165.0	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	1.3	*	1.3	*	1.3	*	1.3	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	165.9	*	165.9	*	165.9	*	165.9	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	4588.2	0.002	4588.2	0.002	4588.2	0.002	72.8	*	DowS	DowS	Esso
23	Octachlorostyrene	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	DowS	DowS	DowS
24	Total TCDF	15 0	pg/L	1078 3	*	1078 3	*	1078.3	*	1078 3	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3 0	*	3 0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30 0	pg/L	13 2	*	13.2	*	13.2	*	13 2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	60.2	*	60.2	*	60 2	*	60.2	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	49.5	*	49 5	*	49.5	*	49 5	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	567 7	*	567 7	*	567.7	*	567.7	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	2 1	1.054	2 1	1 054	2.1	1.054	2.1	1.054	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 1700 - Block 90 Feed (Buildings 35 & 39) flows into CO 0900
AVERAGE FLOWRATE = 1099 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	53	60.713	53	60.713	53	60.713	31	34.069	DowS	DowS	Esso
2	Cyanide Total	0.005	mg/L	0.005	0.006	0.005	0.006	0.005	0.006	0.005	0.006	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.04	0.047	0.04	0.047	0.04	0.047	0.04	0.047	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.30	0.330	0.30	0.330	0.30	0.330	0.30	0.330	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.7	0.835	0.7	0.835	0.7	0.835	0.7	0.835	DowS	DowS	DowS
5	DOC	0.5	mg/L	7.7	8.437	7.7	8.437	7.7	8.437	4.4	4.836	DowS	DowS	Esso
5	TOC	5	mg/L	8	8.498	8	8.498	8	8.498	5	5.495	DowS	DowS	Esso
6	Total phosphorus	0.10	mg/L	0.10	0.116	0.10	0.116	0.10	0.116	0.10	0.116	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	23	24.649	23	24.649	5	5.495	5	5.495	DowS	P1774	P1774
8	Volatile suspended solids	10	mg/L	12	13.105	12	13.105	5	5.495	5	5.495	DowS	P1774	P1774
9	Aluminum	30.0	ug/L	129.9	0.147	129.9	0.147	47.0	0.052	47.0	0.052	DowS	RREL	RREL
9	Boron	50.0	ug/L	63.5	0.071	63.5	0.071	63.5	0.071	63.5	0.071	DowS	DowS	DowS
9	Chromium	20.0	ug/L	11.4	0.013	11.4	0.013	11.4	0.013	11.4	0.013	DowS	DowS	DowS
9	Copper	10.0	ug/L	24.8	0.028	24.8	0.028	24.8	0.028	20.0	0.022	DowS	DowS	RREL
9	Lead	30.0	ug/L	73.0	0.088	73.0	0.088	73.0	0.088	73.0	0.080	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	67.0	0.076	67.0	0.076	67.0	0.076	67.0	0.076	DowS	DowS	DowS
9	Nickel	20.0	ug/L	145.4	0.169	145.4	0.169	38.0	0.042	38.0	0.042	DowS	RREL	RREL
9	Vanadium	30.0	ug/L	4.8	0.005	4.8	0.005	4.8	0.005	4.8	0.005	DowS	DowS	DowS
9	Zinc	10.0	ug/L	182.8	0.222	182.8	0.222	42.0	0.046	42.0	0.046	DowS	RREL	RREL
12	Mercury	0.10	ug/L	0.11	*	0.11	*	0.11	*	0.11	*	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	8.1	0.009	8.1	0.009	8.1	0.009	2.5	0.003	DowS	DowS	Esso
15	Sulphide	20.0	ug/L	40.0	0.046	40.0	0.046	40.0	0.046	40.0	0.046	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	15.9	0.018	15.9	0.018	15.9	0.018	15.9	0.018	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	124.2	0.138	124.2	0.138	11.2	0.012	11.2	0.012	DowS	P913	P913
16	1,1-Dichloroethane	0.8	ug/L	246.5	0.280	246.5	0.280	ND(10)	0.011	ND(10)	0.011	DowS	P913	P913
16	1,1-Dichloroethylene	2.8	ug/L	22.0	0.025	22.0	0.025	ND(10)	0.011	ND(10)	0.011	DowS	P913	P913
16	1,2-Dichloroethane	0.8	ug/L	1070.0	1.155	1070.0	1.155	73.3	0.081	73.3	0.081	DowS	P913	P913
16	1,2-Dichloropropane	0.9	ug/L	38.6	0.046	38.6	0.046	38.6	0.046	38.6	0.046	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	2.6	0.002	2.6	0.002	2.6	0.002	0.4	*	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	7.5	0.009	7.5	0.009	7.5	0.009	7.5	0.009	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	15.3	0.017	15.3	0.017	7.0	0.008	7.0	0.008	DowS	RREL	RREL
16	Chloroform	0.7	ug/L	8.6	0.010	8.6	0.010	8.6	0.010	1.2	0.001	DowS	DowS	Esso
16	Chloromethane	3.7	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	4.5	0.005	4.5	0.005	4.5	0.005	4.5	0.005	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	7.5	0.009	7.5	0.009	7.5	0.009	7.5	0.009	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	42.2	0.048	42.2	0.048	ND(10)	0.011	ND(10)	0.011	DowS	P913	P913
16	Tetrachloroethylene	1.1	ug/L	73.5	0.082	73.5	0.082	18.4	0.020	2.1	0.002	DowS	P913	Esso
16	Trichloroethylene	1.9	ug/L	27.6	0.030	27.6	0.030	ND(10)	0.011	ND(10)	0.011	DowS	P913	P913

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 1700 - Block 90 Feed (Buildings 35 & 39) flows into CO 0900
AVERAGE FLOWRATE = 1099 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	47.2	0.058	47.2	0.058	47.2	0.058	2.6	0.003	DowS	DowS	Esso
17	Benzene	0.5	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	0.6	0.001	0.6	0.001	0.6	0.001	0.6	0.001	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.001	1.5	0.001	1.5	0.001	1.5	0.001	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.002	1.4	0.002	1.4	0.002	1.4	0.002	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	5.8	0.007	5.8	0.007	5.8	0.007	5.8	0.007	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.7	0.001	0.7	0.001	0.7	0.001	0.7	0.001	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.002	1.4	0.002	1.4	0.002	1.4	0.002	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	1.4	0.001	1.4	0.001	1.4	0.001	1.4	0.001	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.001	0.5	0.001	0.5	0.001	0.5	0.001	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.003	2.4	0.003	2.4	0.003	2.4	0.003	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	2.0	*	2.0	*	2.0	*	2.0	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	1966.3	0.002	1966.3	0.002	1966.3	0.002	1966.3	0.002	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	856.6	0.001	856.6	0.001	856.6	0.001	856.6	0.001	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	723.3	0.001	723.3	0.001	723.3	0.001	723.3	0.001	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	82.9	*	82.9	*	82.9	*	82.9	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	155.0	*	155.0	*	155.0	*	155.0	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	2.3	*	2.3	*	2.3	*	2.3	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	93.1	*	93.1	*	93.1	*	93.1	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	407.9	*	407.9	*	407.9	*	407.9	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	7.7	*	7.7	*	7.7	*	7.7	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	941.7	*	941.7	*	941.7	*	941.7	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	1869.0	*	1869.0	*	1869.0	*	1869.0	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	226.2	*	226.2	*	226.2	*	226.2	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	5701.0	*	5701.0	*	5701.0	*	5701.0	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.4	1.573	1.4	1.573	1.4	1.573	1.4	1.573	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 1900 - Biox Plant Effluent flows into CO 0900
AVERAGE FLOWRATE = 8650 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	1723	13958.067	1723	13958.067	69	597.402	10	86.580	DowS	Polysar	RMDL
2	Cyanide Total	0.005	mg/L	0.005	0.044	0.005	0.044	0.005	0.044	0.005	0.044	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	2.87	28.263	2.87	28.263	1.57	13.593	0.25	2.165	DowS	Polysar	RMDL
4	Nitrate+Nitrite	0.25	mg/L	0.03	0.283	0.03	0.283	0.03	0.283	0.03	0.283	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.5	13.118	1.5	13.118	1.5	13.118	0.5	4.329	DowS	DowS	RMDL
5	DOC	0.5	mg/L	4.9	43.551	4.9	43.551	4.9	43.551	0.5	4.329	DowS	DowS	RMDL
5	TOC	5	mg/L	6	50.461	6	50.461	6	50.461	5	43.290	DowS	DowS	RMDL
6	Total phosphorus	0.10	mg/L	0.29	2.645	0.29	2.645	0.29	2.645	0.1	0.866	DowS	DowS	RMDL
8	Total suspended solids	5	mg/L	34	303.627	34	303.627	15	129.870	5	43.290	DowS	Polysar	RMDL
8	Volatile suspended solids	10	mg/L	15	127.542	15	127.542	10	86.580	10	86.580	DowS	Polysar	RMDL
9	Aluminum	30.0	ug/L	415.5	3.666	415.5	3.666	415.5	3.666	30	0.260	DowS	DowS	RMDL
9	Boron	50.0	ug/L	49.3	0.365	49.3	0.365	49.3	0.365	49.3	0.365	DowS	DowS	DowS
9	Chromium	20.0	ug/L	5.9	0.052	5.9	0.052	5.9	0.052	5.9	0.052	DowS	DowS	DowS
9	Copper	10.0	ug/L	9.9	0.089	9.9	0.089	9.9	0.089	9.9	0.089	DowS	DowS	DowS
9	Lead	30.0	ug/L	35.0	0.304	35.0	0.304	35.0	0.304	30	0.260	DowS	DowS	RMDL
9	Molybdenum	20.0	ug/L	35.9	0.298	35.9	0.298	35.9	0.298	20	0.173	DowS	DowS	RMDL
9	Nickel	20.0	ug/L	42.5	0.373	42.5	0.373	42.5	0.373	20	0.173	DowS	DowS	RMDL
9	Vanadium	30.0	ug/L	7.5	0.065	7.5	0.065	7.5	0.065	7.5	0.065	DowS	DowS	DowS
9	Zinc	10.0	ug/L	31.6	0.257	31.6	0.257	31.6	0.257	10	0.087	DowS	DowS	RMDL
12	Mercury	0.10	ug/L	0.73	0.005	0.73	0.005	0.73	0.005	0.1	0.001	DowS	DowS	RMDL
14	Phenolics (4AAP)	2.0	ug/L	32.1	0.297	32.1	0.297	10.1	0.297	2	0.017	DowS	Polysar	RMDL
15	Sulphide	20.0	ug/L	112.5	0.987	112.5	0.987	112.5	0.987	20	0.173	DowS	DowS	RMDL
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.7	0.006	0.7	0.006	0.7	0.006	0.7	0.006	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.2	0.002	0.2	0.002	0.2	0.002	0.2	0.002	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.2	0.002	0.2	0.002	0.2	0.002	0.2	0.002	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	1.5	0.013	1.5	0.013	1.5	0.013	1.5	0.013	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	3.4	0.030	3.4	0.030	3.4	0.030	0.8	0.007	DowS	DowS	RMDL
16	1,2-Dichloropropane	0.9	ug/L	26.8	0.215	26.8	0.215	26.8	0.232	0.9	0.008	DowS	DowS	RMDL
16	Bromodichloromethane	0.8	ug/L	0.3	0.003	0.3	0.003	0.3	0.003	0.3	0.003	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.4	0.004	0.4	0.004	0.4	0.004	0.4	0.004	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	0.9	0.008	0.9	0.008	0.9	0.008	0.9	0.008	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.4	0.003	0.4	0.003	0.4	0.003	0.4	0.003	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	1.3	0.011	1.3	0.011	1.3	0.011	1.3	0.011	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.004	0.5	0.004	0.5	0.004	0.5	0.004	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.4	0.003	0.4	0.003	0.4	0.003	0.4	0.003	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	4.9	0.039	4.9	0.039	4.9	0.039	1.3	0.011	DowS	DowS	RMDL
16	Tetrachloroethylene	1.1	ug/L	1.1	0.010	1.1	0.010	1.1	0.010	1.1	0.010	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.4	0.004	0.4	0.004	0.4	0.004	0.4	0.004	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC - SARNIA

PR 1900 - Biox Plant Effluent flows into CO 0900
AVERAGE FLOWRATE = 8650 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Vinyl chloride	4.0	ug/L	0.7	0.006	0.7	0.006	0.7	0.006	0.7	0.006	DowS	DowS	DowS
17	Benzene	0.5	ug/L	1.4	0.013	1.4	0.013	1.4	0.013	0.5	0.004	DowS	DowS	RMDL
17	Ethylbenzene	0.6	ug/L	0.8	0.008	0.8	0.008	0.8	0.008	0.6	0.005	DowS	DowS	RMDL
17	Styrene	0.5	ug/L	0.9	0.008	0.9	0.008	0.9	0.008	0.5	0.004	DowS	DowS	RMDL
17	m-Xylene and p-Xylene	1.1	ug/L	1.1	0.009	1.1	0.009	1.1	0.009	1.1	0.009	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.9	0.008	0.9	0.008	0.9	0.008	0.5	0.004	DowS	DowS	RMDL
19	2,6-Dinitrotoluene	0.7	ug/L	0.7	0.006	0.7	0.006	0.7	0.006	0.7	0.006	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.6	0.015	1.6	0.015	1.6	0.015	1.6	0.015	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.001	0.1	0.001	0.1	0.001	0.1	0.001	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.1	0.009	1.1	0.009	1.1	0.009	0.6	0.005	DowS	DowS	RMDL
19	Bis(2-chloroethyl)ether	4.4	ug/L	15.8	0.138	15.8	0.138	2.0	0.017	2.0	0.017	DowS	RREL	RREL
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	66.6	0.564	66.6	0.564	2.0	0.017	2.0	0.017	DowS	RREL	RREL
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.4	0.003	0.4	0.003	0.4	0.003	0.4	0.003	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.012	1.4	0.012	1.4	0.012	1.4	0.012	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	5.1	0.045	5.1	0.045	5.1	0.045	3.1	0.005	DowS	DowS	RMDL
19	Naphthalene	1.6	ug/L	1.3	0.012	1.3	0.012	1.3	0.012	1.3	0.012	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.004	0.5	0.004	0.5	0.004	0.4	0.003	DowS	DowS	RMDL
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.005	0.5	0.005	0.5	0.005	0.5	0.005	DowS	DowS	DowS
20	Phenol	2.4	ug/L	5.3	0.044	5.3	0.044	5.3	0.044	2.4	0.021	DowS	DowS	RMDL
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	25.3	*	25.3	*	25.3	*	10	*	DowS	DowS	RMDL
23	1,2,4-Trichlorobenzene	10.0	ng/L	9.0	*	9.0	*	9.0	*	9.0	*	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	5.3	*	5.3	*	5.3	*	5.3	*	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	3.6	*	3.6	*	3.6	*	3.6	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	3.1	*	3.1	*	3.1	*	3.1	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	104.8	*	104.8	*	104.8	*	15	*	DowS	DowS	RMDL
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	15.1	*	15.1	*	15.1	*	15	*	DowS	DowS	RMDL
24	Total H6CDD	30.0	pg/L	3.3	*	3.3	*	3.3	*	3.3	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	34.7	*	34.7	*	34.7	*	20	*	DowS	DowS	RMDL
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	56.4	*	56.4	*	56.4	*	30	*	DowS	DowS	RMDL
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	64.5	*	64.5	*	64.5	*	30	*	DowS	DowS	RMDL
24	Octachlorodibenzofuran	30.0	pg/L	140.6	*	140.6	*	140.6	*	30	*	DowS	DowS	RMDL
25	Oil and grease	1.0	mg/L	4.7	37.932	4.7	37.932	4.7	37.932	1	8.658	DowS	DowS	RMDL

* Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 2000 - Boiler Feedwater Effluent flows into CO 0900
AVERAGE FLOWRATE = 1042 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	63	73.492	63	73.492	63	73.492	31	32.302	DowS	DowS	Esso
2	Cyanide Total	0.005	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.08	0.084	0.08	0.084	0.08	0.084	0.08	0.084	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	1.56	1.790	1.56	1.790	1.56	1.790	1.56	1.790	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.1	1.220	1.1	1.220	1.1	1.220	1.1	1.220	DowS	DowS	DowS
5	DOC	0.5	mg/L	3.9	4.171	3.9	4.171	3.9	4.171	3.9	4.171	DowS	DowS	DowS
5	TOC	5	mg/L	4	4.123	4	4.123	4	4.123	4	4.123	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.08	0.079	0.08	0.079	0.08	0.079	0.08	0.079	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	11	12.534	11	12.534	11	12.534	5	5.210	DowS	DowS	P1774
8	Volatile suspended solids	10	mg/L	4	3.743	4	3.743	4	3.743	4	3.743	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	68.3	0.078	68.3	0.078	68.3	0.078	47.0	0.049	DowS	DowS	RREL
9	Boron	50.0	ug/L	27.7	0.031	27.7	0.031	27.7	0.031	27.7	0.031	DowS	DowS	DowS
9	Chromium	20.0	ug/L	4.9	0.006	4.9	0.006	4.9	0.006	4.9	0.006	DowS	DowS	DowS
9	Copper	10.0	ug/L	5.9	0.007	5.9	0.007	5.9	0.007	5.9	0.007	DowS	DowS	DowS
9	Lead	30.0	ug/L	157.9	0.195	157.9**	0.195	157.9**	0.195	157.9**	0.195	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	18.1	0.019	18.1	0.019	18.1	0.019	18.1	0.019	DowS	DowS	DowS
9	Nickel	20.0	ug/L	7.7	0.009	7.7	0.009	7.7	0.009	7.7	0.009	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	39.0	0.044	39.0	0.044	39.0	0.044	39.0	0.044	DowS	DowS	DowS
9	Zinc	10.0	ug/L	6.7	0.007	6.7	0.007	6.7	0.007	6.7	0.007	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.09	*	0.09	*	0.09	*	0.09	*	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	20.6	0.024	20.6	0.024	20.6	0.024	2.5	0.003	DowS	DowS	Esso
15	Sulphide	20.0	ug/L	42.5	0.047	42.5	0.047	42.5	0.047	42.5	0.047	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.8	0.001	0.8	0.001	0.8	0.001	0.8	0.001	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	0.8	0.001	0.8	0.001	0.8	0.001	0.8	0.001	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	2.2	0.002	2.2	0.002	2.2	0.002	2.2	0.002	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC - SARNIA

PR 2000 - Boiler Feedwater Effluent flows into CO 0900
AVERAGE FLOWRATE = 1042 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAG		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	0.9	0.001	0.9	0.001	0.9	0.001	0.9	0.001	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.002	1.5	0.002	1.5	0.002	1.5	0.002	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.002	1.4	0.002	1.4	0.002	1.4	0.002	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.4	0.002	1.4	0.002	1.4	0.002	1.4	0.002	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.5	0.002	1.5	0.002	1.5	0.002	1.5	0.002	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	1.3	0.001	1.3	0.001	1.3	0.001	1.3	0.001	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.001	0.5	0.001	0.5	0.001	0.5	0.001	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.001	0.5	0.001	0.5	0.001	0.5	0.001	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.003	2.4	0.003	2.4	0.003	2.4	0.003	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.0	*	7.0	*	7.0	*	7.0	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	9.0	*	9.0	*	9.0	*	9.0	*	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	9.0	*	9.0	*	9.0	*	9.0	*	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	7.0	*	7.0	*	7.0	*	7.0	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	6.8	*	6.8	*	6.8	*	6.8	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	6.3	*	6.3	*	6.3	*	6.3	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	9.0	*	9.0	*	9.0	*	9.0	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	3.8	*	3.8	*	3.8	*	3.8	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	48.0	*	48.0	*	48.0	*	48.0	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	34.3	*	34.3	*	34.3	*	34.3	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	262.0	*	262.0	*	262.0	*	262.0	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.3	1.513	1.3	1.513	1.3	1.513	1.3	1.513	DowS	DowS	DowS

* - Less than 1 gram per day

** - Data suspect, therefore no technology recommended

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 2100 - Scott Road Treated Runoff to River
AVERAGE FLOWRATE = 130 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL A ERAGE CONC	BAT OPTION 3 ANNUAL A ERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	101	13.384	101	13.384	101	13.384	31	4.030	DowS	DowS	Esso
2	Cyanide Total	0.005	mg/L	0.009	0.001	0.009	0.001	0.009	0.001	0.009	0.001	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	3.67	0.326	3.67	0.326	3.67	0.326	3.67	0.326	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.03	0.004	0.03	0.004	0.03	0.004	0.03	0.004	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	3.0	0.294	3.0	0.294	3.0	0.294	3.0	0.294	DowS	DowS	DowS
5	DOC	0.5	mg/L	22.4	2.912	22.4	2.912	22.4	2.912	4.4	0.572	DowS	DowS	Esso
5	TOC	5	mg/L	24	3.159	24	3.159	24	3.159	5	0.650	DowS	DowS	Esso
6	Total phosphorus	0.10	mg/L	0.27	0.024	0.27	0.024	0.27	0.024	0.27	0.024	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	5	0.643	5	0.643	5	0.643	5	0.643	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	4	0.497	4	0.497	4	0.497	4	0.497	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	66.2	0.007	66.2	0.007	66.2	0.007	47.0	0.006	DowS	DowS	RREL
9	Boron	50.0	ug/L	3408.8	0.395	3408.8	0.395	3408.8	0.395	3408.8	0.395	DowS	DowS	DowS**
9	Chromium	20.0	ug/L	11.4	0.002	11.4	0.002	11.4	0.002	11.4	0.002	DowS	DowS	DowS
9	Copper	10.0	ug/L	5.4	*	5.4	*	5.4	*	5.4	*	DowS	DowS	DowS
9	Lead	30.0	ug/L	24.0	0.003	24.0	0.003	24.0	0.003	24.0	0.003	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	25.3	0.002	25.3	0.002	25.3	0.002	25.3	0.002	DowS	DowS	DowS
9	Nickel	20.0	ug/L	8.1	0.001	8.1	0.001	8.1	0.001	8.1	0.001	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	42.3	0.006	42.3	0.006	42.3	0.006	42.3	0.006	DowS	DowS	DowS
9	Zinc	10.0	ug/L	5.4	0.001	5.4	0.001	5.4	0.001	5.4	0.001	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.13	*	0.13	*	0.13	*	0.13	*	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	9.7	0.001	9.7	0.001	9.7	0.001	2.5	0.001	DowS	DowS	Esso
15	Sulphide	20.0	ug/L	62.5	0.004	62.5	0.004	62.5	0.004	62.5	0.004	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	15.6	0.002	15.6	0.002	15.6	0.002	15.6	0.002	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	38.7	0.005	38.7	0.005	38.7	0.005	38.7	0.005	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	5.2	0.001	5.2	0.001	5.2	0.001	5.2	0.001	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	0.8	*	0.8	*	0.8	*	0.8	*	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	2.3	*	2.3	*	2.3	*	1.2	*	DowS	DowS	Esso
16	Chloromethane	3.7	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	6.6	0.001	6.6	0.001	6.6	0.001	6.6	0.001	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	0.9	*	0.9	*	0.9	*	0.9	*	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

PR 2100 - Scott Road Treated Runoff to River
AVERAGE FLOWRATE = 130 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Vinyl chloride	4.0	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	0.8	*	0.8	*	0.8	*	0.8	*	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	*	1.5	*	1.5	*	1.5	*	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	*	1.0	*	1.0	*	1.0	*	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	*	1.4	*	1.4	*	1.4	*	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	2.1	*	2.1	*	2.1	*	2.1	*	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.9	*	0.9	*	0.9	*	0.9	*	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.5	*	1.5	*	1.5	*	1.5	*	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	0.9	*	0.9	*	0.9	*	0.9	*	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	*	2.4	*	2.4	*	2.4	*	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	3.2	*	3.2	*	3.2	*	3.2	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	1667.6	*	1667.6	*	1667.6	*	1667.6	*	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	397.7	*	397.7	*	397.7	*	397.7	*	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	42.8	*	42.8	*	42.8	*	42.8	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	416.6	*	416.6	*	416.6	*	217.3	*	DowS	DowS	Esso
23	Hexachlorocyclopentadiene	10.0	ng/L	2.5	*	2.5	*	2.5	*	2.5	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	394.4	*	394.4	*	394.4	*	72.8	*	DowS	DowS	Esso
23	Octachlorostyrene	10.0	ng/L	734.6	*	734.6	*	734.6	*	734.6	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	3.4	*	3.4	*	3.4	*	3.4	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	41.0	*	41.0	*	41.0	*	41.0	*	DowS	DowS	DowS**
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	45.9	*	45.9	*	45.9	*	35.0	*	DowS	DowS	Esso
24	Octachlorodibenzofuran	30.0	pg/L	606.2	*	606.2	*	606.2	*	30.0	*	DowS	DowS	Esso
25	Oil and grease	1.0	mg/L	46.1	5.890	46.1	5.890	4.1	0.533	4.1	0.533	DowS	Amoco	Amoco

* - Less than 1 gram per day

** - No performance data but reductions are anticipated based on the addition of granular activated carbon and multi-media filtration in BAT Option 3

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0200 - 42 inch Outfall to River
AVERAGE FLOWRATE = 82887 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AV RAGE CONC	BAT OPTION 3 ANNUAL AV RAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	6	462.368	6	462.368	6	462.368	6	462.368	DowS	DowS	DowS
2	Cyanide Total	0.005	mg/L	0.005	0.372	0.005	0.372	0.005	0.372	0.005	0.372	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.03	1.859	0.03	1.859	0.03	1.859	0.03	1.859	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.28	20.611	0.28	20.611	0.28	20.611	0.28	20.611	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	40.189	0.6	40.189	0.6	40.189	0.6	40.189	DowS	DowS	DowS
5	DOC	0.5	mg/L	2.3	184.700	2.3	184.700	2.3	184.700	2.3	184.700	DowS	DowS	DowS
5	TOC	5	mg/L	2	166.532	2	166.532	2	166.532	2	166.532	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.07	4.584	0.07	4.584	0.07	4.584	0.07	4.584	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	6	408.427	6	408.427	6	408.427	5	414.435	DowS	DowS	P1774
8	Volatile suspended solids	10	mg/L	3	223.150	3	223.150	3	223.150	3	223.150	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	56.0	3.588	56.0	3.588	56.0	3.588	47.0	3.896	DowS	DowS	RREL
9	Boron	50.0	ug/L	9.3	0.688	9.3	0.688	9.3	0.688	9.3	0.688	DowS	DowS	DowS
9	Chromium	20.0	ug/L	5.8	0.526	5.8	0.526	5.8	0.526	5.8	0.526	DowS	DowS	DowS
9	Copper	10.0	ug/L	10.3	1.020	10.3	1.020	10.3	1.020	10.3	1.020	DowS	DowS	DowS
9	Lead	30.0	ug/L	24.0	1.785	24.0	1.785	24.0	1.785	24.0	1.785	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	18.0	1.507	18.0	1.507	18.0	1.507	18.0	1.507	DowS	DowS	DowS
9	Nickel	20.0	ug/L	6.0	0.446	6.0	0.446	6.0	0.446	6.0	0.446	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	15.5	1.124	15.5	1.124	15.5	1.124	15.5	1.124	DowS	DowS	DowS
9	Zinc	10.0	ug/L	3.0	0.223	3.0	0.223	3.0	0.223	3.0	0.223	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.09	0.007	0.09	0.007	0.09	0.007	0.09	0.007	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	5.6	0.377	5.6	0.377	5.6	0.377	2.5	0.207	DowS	DowS	Esso
15	Sulphide	20.0	ug/L	42.5	3.035	42.5	3.035	42.5	3.035	42.5	3.035	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.8	0.070	0.8	0.070	0.8	0.070	0.8	0.070	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.7	0.053	0.7	0.053	0.7	0.053	0.7	0.053	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	1.4	0.108	1.4	0.108	1.4	0.108	1.4	0.108	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.6	0.050	0.6	0.050	0.6	0.050	0.6	0.050	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	11.7	0.962	11.7	0.962	11.7	0.962	11.7	0.962	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	4.8	0.334	4.8	0.334	4.8	0.334	4.8	0.334	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.024	0.3	0.024	0.3	0.024	0.3	0.024	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.047	0.6	0.047	0.6	0.047	0.6	0.047	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	33.4	2.728	33.4	2.728	33.4	2.728	10.0	0.829	DowS	DowS	RREL
16	Chloroform	0.7	ug/L	1.8	0.146	1.8	0.146	1.8	0.146	1.2	0.099	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	8.0	0.582	8.0	0.582	8.0	0.582	8.0	0.582	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	1.1	0.079	1.1	0.079	1.1	0.079	1.1	0.079	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.5	0.036	0.5	0.036	0.5	0.036	0.5	0.036	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.8	0.072	0.8	0.072	0.8	0.072	0.8	0.072	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	40.9	3.291	40.9	3.291	40.9	3.291	2.1	0.174	DowS	DowS	Esso
16	Trichloroethylene	1.9	ug/L	3.5	0.283	3.5	0.283	3.5	0.283	3.5	0.283	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0200 - 42 inch Outfall to River
AVERAGE FLOWRATE = 82887 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	1.5	0.112	1.5	0.112	1.5	0.112	1.5	0.112	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.3	0.017	0.3	0.017	0.3	0.017	0.3	0.017	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.3	0.022	0.3	0.022	0.3	0.022	0.3	0.022	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.4	0.026	0.4	0.026	0.4	0.026	0.4	0.026	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.7	0.048	0.7	0.048	0.7	0.048	0.7	0.048	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.4	0.026	0.4	0.026	0.4	0.026	0.4	0.026	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	1.7	0.091	1.7	0.091	1.7	0.091	1.7	0.091	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.093	1.5	0.093	1.5	0.093	1.5	0.093	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.008	0.1	0.008	0.1	0.008	0.1	0.008	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.074	1.0	0.074	1.0	0.074	1.0	0.074	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.104	1.4	0.104	1.4	0.104	1.4	0.104	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	1.2	0.089	1.2	0.089	1.2	0.089	1.2	0.089	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.5	0.030	0.5	0.030	0.5	0.030	0.5	0.030	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.104	1.4	0.104	1.4	0.104	1.4	0.104	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	1.0	0.073	1.0	0.073	1.0	0.073	1.0	0.073	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.075	1.2	0.075	1.2	0.075	1.2	0.075	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.033	0.5	0.033	0.5	0.033	0.5	0.033	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.030	0.5	0.030	0.5	0.030	0.5	0.030	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.178	2.4	0.178	2.4	0.178	2.4	0.178	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.0	0.001	7.0	0.001	7.0	0.001	7.0	0.001	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	157.3	0.012	157.3	0.012	157.3	0.012	157.3	0.012	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	77.9	0.006	77.9	0.006	77.9	0.006	77.9	0.006	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	30.8	0.002	30.8	0.002	30.8	0.002	30.8	0.002	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	106.1	0.009	106.1	0.009	106.1	0.009	106.1	0.009	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	96.1	0.007	96.1	0.007	96.1	0.007	72.8	0.006	DowS	DowS	Esso
23	Octachlorostyrene	10.0	ng/L	15.2	0.001	15.2	0.001	15.2	0.001	15.2	0.001	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	3.4	*	3.4	*	3.4	*	3.4	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	10.7	*	10.7	*	10.7	*	10.7	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	48.1	*	48.1	*	48.1	*	48.1	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	27.9	*	27.9	*	27.9	*	27.9	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.3	104.557	1.3	104.557	1.3	104.557	1.3	104.557	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0500 - 54 inch Sluice Outfall to River
AVERAGE FLOWRATE = 48783 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 LOAD KG/DAY	BAT OPTION 3 ANNUAL AV RAGE CONC	BAT OPTION 3 LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	8	468.946	8	468.946	8	468.946	8	468.946	DowS	DowS	DowS
2	Cyanide Total	0.005	mg/L	0.005	0.273	0.005	0.273	0.005	0.273	0.005	0.273	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.09	2.364	0.09	2.364	0.09	2.364	0.09	2.364	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.36	16.557	0.36	16.557	0.36	16.557	0.36	16.557	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.0	34.041	1.0	34.041	1.0	34.041	1.0	34.041	DowS	DowS	DowS
5	DOC	0.5	mg/L	2.3	107.254	2.3	107.254	2.3	107.254	2.3	107.254	DowS	DowS	DowS
5	TOC	5	mg/L	2	100.536	2	100.536	2	100.536	2	100.536	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.05	2.244	0.05	2.244	0.05	2.244	0.05	2.244	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	5	221.676	5	221.676	5	221.676	5	221.676	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	3	163.567	3	163.567	3	163.567	3	163.567	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	102.3	4.848	102.3	4.848	102.3	4.848	102.3	4.848	DowS	DowS	DowS
9	Boron	50.0	ug/L	9.5	0.515	9.5	0.515	9.5	0.515	9.5	0.515	DowS	DowS	DowS
9	Chromium	20.0	ug/L	3.3	0.174	3.3	0.174	3.3	0.174	3.3	0.174	DowS	DowS	DowS
9	Copper	10.0	ug/L	3.5	0.185	3.5	0.185	3.5	0.185	3.5	0.185	DowS	DowS	DowS
9	Lead	30.0	ug/L	24.0	1.308	24.0	1.308	24.0	1.308	24.0	1.308	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	18.8	1.323	18.8	1.323	18.8	1.323	18.8	1.323	DowS	DowS	DowS
9	Nickel	20.0	ug/L	6.0	0.327	6.0	0.327	6.0	0.327	6.0	0.327	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	14.0	0.875	14.0	0.875	14.0	0.875	14.0	0.875	DowS	DowS	DowS
9	Zinc	10.0	ug/L	3.3	0.167	3.3	0.167	3.3	0.167	3.3	0.167	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.13	0.006	0.13	0.006	0.13	0.006	0.13	0.006	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	7.0	0.266	7.0	0.266	2.5	0.122	2.5	0.122	DowS	Esso	Esso
15	Sulphide	20.0	ug/L	45.0	1.770	45.0	1.770	45.0	1.770	45.0	1.770	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.9	0.042	0.9	0.042	0.9	0.042	0.9	0.042	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.4	0.018	0.4	0.018	0.4	0.018	0.4	0.018	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.4	0.018	0.4	0.018	0.4	0.018	0.4	0.018	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.5	0.026	0.5	0.026	0.5	0.026	0.5	0.026	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	0.5	0.025	0.5	0.025	0.5	0.025	0.5	0.025	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	4.3	0.203	4.3	0.203	4.3	0.203	4.3	0.203	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.014	0.3	0.014	0.3	0.014	0.3	0.014	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.031	0.6	0.031	0.6	0.031	0.6	0.031	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	1.2	0.059	1.2	0.059	1.2	0.059	1.2	0.059	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.7	0.033	0.7	0.033	0.7	0.033	0.7	0.033	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	12.7	0.494	12.7	0.494	12.7	0.494	12.7	0.494	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.023	0.5	0.023	0.5	0.023	0.5	0.023	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.5	0.023	0.5	0.023	0.5	0.023	0.5	0.023	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.5	0.022	0.5	0.022	0.5	0.022	0.5	0.022	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	3.1	0.123	3.1	0.123	3.1	0.123	3.1	0.123	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.5	0.023	0.5	0.023	0.5	0.023	0.5	0.023	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0500 - 54 inch Sluice Outfall to River
AVERAGE FLOWRATE = 48783 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Vinyl chloride	4.0	ug/L	1.0	0.050	1.0	0.050	1.0	0.050	1.0	0.050	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.2	0.011	0.2	0.011	0.2	0.011	0.2	0.011	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.2	0.011	0.2	0.011	0.2	0.011	0.2	0.011	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.3	0.016	0.3	0.016	0.3	0.016	0.3	0.016	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.5	0.027	0.5	0.027	0.5	0.027	0.5	0.027	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.3	0.016	0.3	0.016	0.3	0.016	0.3	0.016	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	1.1	0.035	1.1	0.035	1.1	0.035	1.1	0.035	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.048	1.5	0.048	1.5	0.048	1.5	0.048	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.2	0.009	0.2	0.009	0.2	0.009	0.2	0.009	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.055	1.0	0.055	1.0	0.055	1.0	0.055	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.076	1.4	0.076	1.4	0.076	1.4	0.076	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	6.8	0.149	6.8	0.149	6.8	0.149	6.8	0.149	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.7	0.030	0.7	0.030	0.7	0.030	0.7	0.030	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.076	1.4	0.076	1.4	0.076	1.4	0.076	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	0.9	0.049	0.9	0.049	0.9	0.049	0.9	0.049	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.039	1.2	0.039	1.2	0.039	1.2	0.039	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.023	0.5	0.023	0.5	0.023	0.5	0.023	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.018	0.5	0.018	0.5	0.018	0.5	0.018	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.131	2.4	0.131	2.4	0.131	2.4	0.131	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.0	*	7.0	*	7.0	*	7.0	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	23.2	0.001	23.2	0.001	23.2	0.001	23.2	0.001	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	9.8	*	9.8	*	9.8	*	9.8	*	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	8.9	*	8.9	*	8.9	*	8.9	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	10.8	*	10.8	*	10.8	*	10.8	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	7.9	*	7.9	*	7.9	*	7.9	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	10.3	*	10.3	*	10.3	*	10.3	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	69.2	*	69.2	*	69.2	*	69.2	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	236.4	*	236.4	*	236.4	*	236.4	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	399.6	*	399.6	*	399.6	*	399.6	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	46.1	*	46.1	*	46.1	*	46.1	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	251.4	*	251.4	*	251.4	*	251.4	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	97.3	*	97.3	*	97.3	*	97.3	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	208.0	*	208.0	*	208.0	*	208.0	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.2	60.525	1.2	60.525	1.2	60.525	1.2	60.525	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0600 - 2nd Street Outfall to River
AVERAGE FLOWRATE = 53872 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AV RAGE CONC	BAT OPTION 3 ANNUAL AV RAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	11	597.413	11	597.413	11	597.413	11	597.413	DowS.	DowS	DowS
2	Cyanide Total	0.005	mg/L	0.005	0.272	0.005	0.272	0.005	0.272	0.005	0.272	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.03	1.357	0.03	1.357	0.03	1.357	0.03	1.357	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.28	14.915	0.28	14.915	0.28	14.915	0.28	14.915	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	28.797	0.5	28.797	0.5	28.797	0.5	28.797	DowS	DowS	DowS
5	DOC	0.5	mg/L	2.3	122.221	2.3	122.221	2.3	122.221	2.3	122.221	DowS	DowS	DowS
5	TOC	5	mg/L	2	117.557	2	117.557	2	117.557	2	117.557	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.06	3.500	0.06	3.500	0.06	3.500	0.06	3.500	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	7	368.549	7	368.549	7	368.549	7	368.549	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	3	162.890	3	162.890	3	162.890	3	162.890	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	35.0	1.975	35.0	1.975	35.0	1.975	35.0	1.975	DowS	DowS	DowS
9	Boron	50.0	ug/L	9.3	0.501	9.3	0.501	9.3	0.501	9.3	0.501	DowS	DowS	DowS
9	Chromium	20.0	ug/L	4.5	0.260	4.5	0.260	4.5	0.260	4.5	0.260	DowS	DowS	DowS
9	Copper	10.0	ug/L	3.0	0.163	3.0	0.163	3.0	0.163	3.0	0.163	DowS	DowS	DowS
9	Lead	30.0	ug/L	24.0	1.303	24.0	1.303	24.0	1.303	24.0	1.303	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	18.3	0.944	18.3	0.944	18.3	0.944	18.3	0.944	DowS	DowS	DowS
9	Nickel	20.0	ug/L	6.0	0.326	6.0	0.326	6.0	0.326	6.0	0.326	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	16.3	0.880	16.3	0.880	16.3	0.880	16.3	0.880	DowS	DowS	DowS
9	Zinc	10.0	ug/L	3.0	0.163	3.0	0.163	3.0	0.163	3.0	0.163	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.09	0.005	0.09	0.005	0.09	0.005	0.09	0.005	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	4.9	0.274	4.9	0.274	4.9	0.274	4.9	0.274	DowS	DowS	DowS
15	Sulphide	20.0	ug/L	30.0	1.671	30.0	1.671	30.0	1.671	30.0	1.671	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.9	0.047	0.9	0.047	0.9	0.047	0.9	0.047	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	1.3	0.065	1.3	0.065	1.3	0.065	1.3	0.065	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.5	0.029	0.5	0.029	0.5	0.029	0.5	0.029	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.5	0.029	0.5	0.029	0.5	0.029	0.5	0.029	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	8.4	0.443	8.4	0.443	8.4	0.443	8.4	0.443	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	6.9	0.371	6.9	0.371	6.9	0.371	6.9	0.371	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.016	0.3	0.016	0.3	0.016	0.3	0.016	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.034	0.6	0.034	0.6	0.034	0.6	0.034	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	1.7	0.088	1.7	0.088	1.7	0.088	1.7	0.088	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.6	0.035	0.6	0.035	0.6	0.035	0.6	0.035	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	11.8	0.669	11.8	0.669	11.8	0.669	11.8	0.669	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.026	0.5	0.026	0.5	0.026	0.5	0.026	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.5	0.026	0.5	0.026	0.5	0.026	0.5	0.026	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	3.9	0.220	3.9	0.220	3.9	0.220	3.9	0.220	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	1.7	0.094	1.7	0.094	1.7	0.094	1.7	0.094	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.6	0.030	0.6	0.030	0.6	0.030	0.6	0.030	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0600 - 2nd Street Outfall to River
AVERAGE FLOWRATE = 53872 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 LOAD KG/DAY	BAT OPTION 3 ANNUAL AV' RAGE CONC	BAT OPTION 3 LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Vinyl chloride	4.0	ug/L	1.1	0.058	1.1	0.058	1.1	0.058	1.1	0.058	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.4	0.024	0.4	0.024	0.4	0.024	0.4	0.024	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.4	0.021	0.4	0.021	0.4	0.021	0.4	0.021	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.4	0.019	0.4	0.019	0.4	0.019	0.4	0.019	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.7	0.035	0.7	0.035	0.7	0.035	0.7	0.035	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.4	0.019	0.4	0.019	0.4	0.019	0.4	0.019	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	0.7	0.039	0.7	0.039	0.7	0.039	0.7	0.039	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.087	1.5	0.087	1.5	0.087	1.5	0.087	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.007	0.1	0.007	0.1	0.007	0.1	0.007	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.054	1.0	0.054	1.0	0.054	1.0	0.054	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.076	1.4	0.076	1.4	0.076	1.4	0.076	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	2.2	0.117	2.2	0.117	2.2	0.117	2.2	0.117	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.0	0.064	1.0	0.064	1.0	0.064	1.0	0.064	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	2.2	0.129	2.2	0.129	2.2	0.129	2.2	0.129	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	0.9	0.049	0.9	0.049	0.9	0.049	0.9	0.049	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.069	1.2	0.069	1.2	0.069	1.2	0.069	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.024	0.5	0.024	0.5	0.024	0.5	0.024	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.025	0.5	0.025	0.5	0.025	0.5	0.025	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.130	2.4	0.130	2.4	0.130	2.4	0.130	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.0	*	7.0	*	7.0	*	7.0	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	30.6	0.002	30.6	0.002	30.6	0.002	30.6	0.002	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	10.3	0.001	10.3	0.001	10.3	0.001	10.3	0.001	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	3.9	*	3.9	*	3.9	*	3.9	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	16.8	0.001	16.8	0.001	16.8	0.001	16.8	0.001	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	6.8	*	6.8	*	6.8	*	6.8	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	9.7	*	9.7	*	9.7	*	9.7	*	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	3.4	*	3.4	*	3.4	*	3.4	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	10.7	*	10.7	*	10.7	*	10.7	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	122.2	*	122.2	*	122.2	*	122.2	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	27.9	*	27.9	*	27.9	*	27.9	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.2	65.155	1.2	65.155	1.2	65.155	1.2	65.155	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0700 - 3rd Street Outfall to River
AVERAGE FLOWRATE = 102070 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	19	2162.768	19	2162.768	19	2162.768	19	2162.768	DowS	DowS	DowS
2	Cyanide Total	0.005	mg/L	0.005	0.508	0.005	0.508	0.005	0.508	0.005	0.508	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.03	2.967	0.03	2.967	0.03	2.967	0.03	2.967	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.30	31.027	0.30	31.027	0.30	31.027	0.30	31.027	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	65.727	0.6	65.727	0.6	65.727	0.6	65.727	DowS	DowS	DowS
5	DOC	0.5	mg/L	2.1	218.951	2.1	218.951	2.1	218.951	2.1	218.951	DowS	DowS	DowS
5	TOC	5	mg/L	2	204.857	2	204.857	2	204.857	2	204.857	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.09	9.020	0.09	9.020	0.09	9.020	0.09	9.020	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	6	579.511	6	579.511	6	579.511	6	579.511	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	3	305.549	3	305.549	3	305.549	3	305.549	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	25.0	2.561	25.0	2.561	25.0	2.561	25.0	2.561	DowS	DowS	DowS
9	Boron	50.0	ug/L	9.8	0.989	9.8	0.989	9.8	0.989	9.8	0.989	DowS	DowS	DowS
9	Chromium	20.0	ug/L	3.0	0.306	3.0	0.306	3.0	0.306	3.0	0.306	DowS	DowS	DowS
9	Copper	10.0	ug/L	3.3	0.336	3.3	0.336	3.3	0.336	3.3	0.336	DowS	DowS	DowS
9	Lead	30.0	ug/L	24.0	2.445	24.0	2.445	24.0	2.445	24.0	2.445	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	18.0	1.704	18.0	1.704	18.0	1.704	18.0	1.704	DowS	DowS	DowS
9	Nickel	20.0	ug/L	6.0	0.611	6.0	0.611	6.0	0.611	6.0	0.611	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	15.8	1.601	15.8	1.601	15.8	1.601	15.8	1.601	DowS	DowS	DowS
9	Zinc	10.0	ug/L	3.0	0.306	3.0	0.306	3.0	0.306	3.0	0.306	DowS	DowS	DowS
12	Mercury	0.10	ug/L	0.09	0.009	0.09	0.009	0.09	0.009	0.09	0.009	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	7.1	0.702	7.1	0.702	7.1	0.702	7.1	0.702	DowS	DowS	DowS
15	Sulphide	20.0	ug/L	37.5	4.022	37.5	4.022	37.5	4.022	37.5	4.022	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.8	0.085	0.8	0.085	0.8	0.085	0.8	0.085	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.3	0.034	0.3	0.034	0.3	0.034	0.3	0.034	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.3	0.034	0.3	0.034	0.3	0.034	0.3	0.034	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.5	0.052	0.5	0.052	0.5	0.052	0.5	0.052	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	0.6	0.055	0.6	0.055	0.6	0.055	0.6	0.055	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	0.3	0.027	0.3	0.027	0.3	0.027	0.3	0.027	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.031	0.3	0.031	0.3	0.031	0.3	0.031	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.061	0.6	0.061	0.6	0.061	0.6	0.061	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	1.5	0.151	1.5	0.151	1.5	0.151	1.5	0.151	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.6	0.063	0.6	0.063	0.6	0.063	0.6	0.063	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	12.0	1.344	12.0	1.344	12.0	1.344	12.0	1.344	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.048	0.5	0.048	0.5	0.048	0.5	0.048	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.5	0.046	0.5	0.046	0.5	0.046	0.5	0.046	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.5	0.048	0.5	0.048	0.5	0.048	0.5	0.048	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	0.8	0.077	0.8	0.077	0.8	0.077	0.8	0.077	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.5	0.048	0.5	0.048	0.5	0.048	0.5	0.048	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC - SARNIA

CO 0700 - 3rd Street Outfall to River
AVERAGE FLOWRATE = 102070 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	2.0	0.203	2.0	0.203	2.0	0.203	2.0	0.203	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.3	0.030	0.3	0.030	0.3	0.030	0.3	0.030	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.5	0.057	0.5	0.057	0.5	0.057	0.5	0.057	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.5	0.049	0.5	0.049	0.5	0.049	0.5	0.049	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.8	0.076	0.8	0.076	0.8	0.076	0.8	0.076	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.4	0.037	0.4	0.037	0.4	0.037	0.4	0.037	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	2.0	0.232	2.0	0.232	2.0	0.232	2.0	0.232	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.167	1.5	0.167	1.5	0.167	1.5	0.167	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.012	0.1	0.012	0.1	0.012	0.1	0.012	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.102	1.0	0.102	1.0	0.102	1.0	0.102	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.143	1.4	0.143	1.4	0.143	1.4	0.143	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	1.2	0.122	1.2	0.122	1.2	0.122	1.2	0.122	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.6	0.063	0.6	0.063	0.6	0.063	0.6	0.063	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.143	1.4	0.143	1.4	0.143	1.4	0.143	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	0.9	0.092	0.9	0.092	0.9	0.092	0.9	0.092	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.133	1.2	0.133	1.2	0.133	1.2	0.133	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.047	0.5	0.047	0.5	0.047	0.5	0.047	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.055	0.5	0.055	0.5	0.055	0.5	0.055	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.240	2.4	0.240	2.4	0.240	2.4	0.240	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.0	0.001	7.0	0.001	7.0	0.001	7.0	0.001	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	13.3	0.001	13.3	0.001	13.3	0.001	13.3	0.001	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	9.0	0.001	9.0	0.001	9.0	0.001	9.0	0.001	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	3.6	*	3.6	*	3.6	*	3.6	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	6.2	0.001	6.2	0.001	6.2	0.001	6.2	0.001	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	5.2	*	5.2	*	5.2	*	5.2	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	11.4	0.001	11.4	0.001	11.4	0.001	11.4	0.001	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	3.4	*	3.4	*	3.4	*	3.4	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	10.7	*	10.7	*	10.7	*	10.7	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	22.4	*	22.4	*	22.4	*	22.4	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	27.9	*	27.9	*	27.9	*	27.9	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.1	118.816	1.1	118.816	1.1	118.816	1.1	118.816	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC - SARNIA

CO 0900 - 4th Street Outfall to River
AVERAGE FLOWRATE = 566,351 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	14	7817.566	14	7817.566	14	7817.566	14	7817.566	DowS	DowS	DowS
2	Cyanide Total	0.005	mg/L	0.005	2.819	0.005	2.819	0.005	2.819	0.005	2.819	DowS	DowS	DowS
4	Ammonia plus Ammonium	0.25	mg/L	0.03	14.925	0.03	14.925	0.03	14.925	0.03	14.925	DowS	DowS	DowS
4	Nitrate+Nitrite	0.25	mg/L	0.29	166.127	0.29	166.127	0.29	166.127	0.29	166.127	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	310.500	0.5	310.500	0.5	310.500	0.5	310.500	DowS	DowS	DowS
5	DOC	0.5	mg/L	2.4	1338.542	2.4	1338.542	2.4	1338.542	2.4	1338.542	DowS	DowS	DowS
5	TOC	5	mg/L	2	1284.578	2	1284.578	2	1284.578	2	1284.578	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.11	67.888	0.11	67.888	0.11	67.888	0.11	67.888	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	6	3043.319	6	3043.319	6	3043.319	6	3043.319	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	3	1726.448	3	1726.448	3	1726.448	3	1726.448	DowS	DowS	DowS
9	Aluminum	30.0	ug/L	58.3	35.518	58.3	35.518	58.3	35.518	58.3	35.518	DowS	DowS	DowS
9	Boron	50.0	ug/L	9.5	5.495	9.5	5.495	9.5	5.495	9.5	5.495	DowS	DowS	DowS
9	Chromium	20.0	ug/L	6.0	3.453	6.0	3.453	6.0	3.453	6.0	3.453	DowS	DowS	DowS
9	Copper	10.0	ug/L	7.0	4.028	7.0	4.028	7.0	4.028	7.0	4.028	DowS	DowS	DowS
9	Lead	30.0	ug/L	36.0	20.717	36.0	20.717	36.0	20.717	36.0	20.717	DowS	DowS	DowS
9	Molybdenum	20.0	ug/L	124.5	57.634	124.5	57.634	124.5	57.634	124.5	57.634	DowS	DowS	DowS
9	Nickel	20.0	ug/L	18.0	10.358	18.0	10.358	18.0	10.358	18.0	10.358	DowS	DowS	DowS
9	Vanadium	30.0	ug/L	4.5	2.599	4.5	2.599	4.5	2.599	4.5	2.599	DowS	DowS	DowS
9	Zinc	10.0	ug/L	144.8	91.421	144.8	91.421	144.8	91.421	144.8	91.421	DowS	DowS**	DowS**
12	Mercury	0.10	ug/L	0.09	0.052	0.09	0.052	0.09	0.052	0.09	0.052	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	10.0	5.580	10.0	5.580	10.0	5.580	10.0	5.580	DowS	DowS**	DowS**
15	Sulphide	20.0	ug/L	35.0	20.802	35.0	20.802	35.0	20.802	35.0	20.802	DowS	DowS	DowS
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.8	0.471	0.8	0.471	0.8	0.471	0.8	0.471	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.3	0.189	0.3	0.189	0.3	0.189	0.3	0.189	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.3	0.189	0.3	0.189	0.3	0.189	0.3	0.189	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.5	0.284	0.5	0.284	0.5	0.284	0.5	0.284	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	1.2	0.693	1.2	0.693	1.2	0.693	1.2	0.693	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	1.2	0.563	1.2	0.563	1.2	0.563	1.2	0.563	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.169	0.3	0.169	0.3	0.169	0.3	0.169	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.335	0.6	0.335	0.6	0.335	0.6	0.335	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	1.3	0.690	1.3	0.690	1.3	0.690	1.3	0.690	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.6	0.343	0.6	0.343	0.6	0.343	0.6	0.343	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	10.0	5.945	10.0	5.945	10.0	5.945	10.0	5.945	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.6	0.349	0.6	0.349	0.6	0.349	0.6	0.349	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.5	0.257	0.5	0.257	0.5	0.257	0.5	0.257	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.5	0.283	0.5	0.283	0.5	0.283	0.5	0.283	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	0.8	0.451	0.8	0.451	0.8	0.451	0.8	0.451	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.5	0.264	0.5	0.264	0.5	0.264	0.5	0.264	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

CO 0900 - 4th Street Outfall to River
AVERAGE FLOWRATE = 566,351 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	1.7	0.985	1.7	0.985	1.7	0.985	1.7	0.985	DowS	DowS	DowS
17	Benzene	0.5	ug/L	1.2	0.730	1.2	0.730	1.2	0.730	1.2	0.730	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	3.7	2.331	3.7	2.331	3.7	2.331	3.7	2.331	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.7	0.387	0.7	0.387	0.7	0.387	0.7	0.387	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.7	0.390	0.7	0.390	0.7	0.390	0.7	0.390	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.4	0.210	0.4	0.210	0.4	0.210	0.4	0.210	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	1.2	0.731	1.2	0.731	1.2	0.731	1.2	0.731	DowS	DowS	DowS
19	2-Chloronaphthalene	1.8	ug/L	1.5	0.912	1.5	0.912	1.5	0.912	1.5	0.912	DowS	DowS	DowS
19	Benzylbutylphthalate	0.6	ug/L	0.1	0.057	0.1	0.057	0.1	0.057	0.1	0.057	DowS	DowS	DowS
19	Biphenyl	0.6	ug/L	1.0	0.575	1.0	0.575	1.0	0.575	1.0	0.575	DowS	DowS	DowS
19	Bis(2-chloroethyl)ether	4.4	ug/L	1.4	0.806	1.4	0.806	1.4	0.806	1.4	0.806	DowS	DowS	DowS
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	3.1	1.894	3.1	1.894	3.1	1.894	3.1	1.894	DowS	DowS	DowS
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	0.3	0.203	0.3	0.203	0.3	0.203	0.3	0.203	DowS	DowS	DowS
19	Di-n-butyl phthalate	3.8	ug/L	1.4	0.806	1.4	0.806	1.4	0.806	1.4	0.806	DowS	DowS	DowS
19	N-Nitrosodi-n-propylamine	3.1	ug/L	0.9	0.518	0.9	0.518	0.9	0.518	0.9	0.518	DowS	DowS	DowS
19	Naphthalene	1.6	ug/L	1.2	0.728	1.2	0.728	1.2	0.728	1.2	0.728	DowS	DowS	DowS
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.5	0.259	0.5	0.259	0.5	0.259	0.5	0.259	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.5	0.301	0.5	0.301	0.5	0.301	0.5	0.301	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.6	1.462	2.6	1.462	2.6	1.462	2.6	1.462	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	7.0	0.004	7.0	0.004	7.0	0.004	7.0	0.004	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	14.1	0.008	14.1	0.008	14.1	0.008	14.1	0.008	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	12.8	0.007	12.8	0.007	12.8	0.007	12.8	0.007	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	3.2	0.002	3.2	0.002	3.2	0.002	3.2	0.002	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	6.5	0.004	6.5	0.004	6.5	0.004	6.5	0.004	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.5	0.003	5.5	0.003	5.5	0.003	5.5	0.003	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	6.1	0.003	6.1	0.003	6.1	0.003	6.1	0.003	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	9.4	0.005	9.4	0.005	9.4	0.005	9.4	0.005	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	3.4	*	3.4	*	3.4	*	3.4	*	DowS	DowS	DowS
24	Total PCDD	20.0	pg/L	9.9	*	9.9	*	9.9	*	9.9	*	DowS	DowS	DowS
24	Total PCDF	15.0	pg/L	5.7	*	5.7	*	5.7	*	5.7	*	DowS	DowS	DowS
24	Total H6CDD	30.0	pg/L	3.0	*	3.0	*	3.0	*	3.0	*	DowS	DowS	DowS
24	Total H6CDF	20.0	pg/L	7.1	*	7.1	*	7.1	*	7.1	*	DowS	DowS	DowS
24	Total H7CDD	30.0	pg/L	13.2	*	13.2	*	13.2	*	13.2	*	DowS	DowS	DowS
24	Total H7CDF	30.0	pg/L	10.7	*	10.7	*	10.7	*	10.7	*	DowS	DowS	DowS
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	22.4	*	22.4	*	22.4	*	22.4	*	DowS	DowS	DowS
24	Octachlorodibenzofuran	30.0	pg/L	27.9	*	27.9	*	27.9	*	27.9	*	DowS	DowS	DowS
25	Oil and grease	1.0	mg/L	1.1	631.542	1.1	631.542	1.1	631.542	1.1	631.542	DowS	DowS	DowS

* - Less than 1 gram per day

** - Although reductions are anticipated based on treatment of PR 1600, PR 1700, PR 2000 and PR 1900 wastewaters, BAT Option 2 and 3 loadings cannot be predicted.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

OT 0300 - 48 inch Outfall to River
AVERAGE FLOWRATE = 60422 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV' RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	2.5	150.995	2.5	150.995	2.5	150.995	2.5	150.995	DowS	DowS	DowS
5	TOC	5	mg/L	2	111.293	2	111.293	2	111.293	2	111.293	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.06	3.680	0.06	3.680	0.06	3.680	0.06	3.680	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	4	246.038	4	246.038	4	246.038	4	246.038	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	-	-	-	-	-	-	-	-			
9	Boron	50.0	ug/L	-	-	-	-	-	-	-	-			
9	Chromium	20.0	ug/L	-	-	-	-	-	-	-	-			
9	Copper	10.0	ug/L	-	-	-	-	-	-	-	-			
9	Lead	30.0	ug/L	-	-	-	-	-	-	-	-			
9	Molybdenum	20.0	ug/L	-	-	-	-	-	-	-	-			
9	Nickel	20.0	ug/L	-	-	-	-	-	-	-	-			
9	Vanadium	30.0	ug/L	-	-	-	-	-	-	-	-			
9	Zinc	10.0	ug/L	-	-	-	-	-	-	-	-			
12	Mercury	0.10	ug/L	-	-	-	-	-	-	-	-			
14	Phenolics (4AAP)	2.0	ug/L	6.0	0.368	6.0	0.368	6.0	0.368	6.0	0.368	DowS	DowS	DowS
15	Sulphide	20.0	ug/L	-	-	-	-	-	-	-	-			
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.9	0.051	0.9	0.051	0.9	0.051	0.9	0.051	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.4	0.021	0.4	0.021	0.4	0.021	0.4	0.021	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.4	0.021	0.4	0.021	0.4	0.021	0.4	0.021	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.5	0.033	0.5	0.033	0.5	0.033	0.5	0.033	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	0.5	0.027	0.5	0.027	0.5	0.027	0.5	0.027	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	0.3	0.017	0.3	0.017	0.3	0.017	0.3	0.017	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.019	0.3	0.019	0.3	0.019	0.3	0.019	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.037	0.6	0.037	0.6	0.037	0.6	0.037	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	1.2	0.073	1.2	0.073	1.2	0.073	1.2	0.073	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.7	0.039	0.7	0.039	0.7	0.039	0.7	0.039	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	13.8	0.783	13.8	0.783	13.8	0.783	13.8	0.783	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.029	0.5	0.029	0.5	0.029	0.5	0.029	DowS	DowS	DowS
16	Dibromochloromethane	1.1	ug/L	0.5	0.029	0.5	0.029	0.5	0.029	0.5	0.029	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.5	0.027	0.5	0.027	0.5	0.027	0.5	0.027	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	0.9	0.053	0.9	0.053	0.9	0.053	0.9	0.053	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.5	0.029	0.5	0.029	0.5	0.029	0.5	0.029	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

OT 0300 - 48 inch Outfall to River
AVERAGE FLOWRATE = 60422 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV' RAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Vinyl chloride	4.0	ug/L	1.1	0.068	1.1	0.068	1.1	0.068	1.1	0.068	DowS	DowS	DowS
17	Benzene	0.5	ug/L	-	-	-	-	-	-	-	-			
17	Ethylbenzene	0.6	ug/L	-	-	-	-	-	-	-	-			
17	Styrene	0.5	ug/L	-	-	-	-	-	-	-	-			
17	m-Xylene and p-Xylene	1.1	ug/L	-	-	-	-	-	-	-	-			
17	o-Xylene	0.5	ug/L	-	-	-	-	-	-	-	-			
19	2,6-Dinitrotoluene	0.7	ug/L	-	-	-	-	-	-	-	-			
19	2-Chloronaphthalene	1.8	ug/L	-	-	-	-	-	-	-	-			
19	Benzylbutylphthalate	0.6	ug/L	-	-	-	-	-	-	-	-			
19	Biphenyl	0.6	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-chloroethyl)ether	4.4	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Di-n-butyl phthalate	3.8	ug/L	-	-	-	-	-	-	-	-			
19	N-Nitrosodi-n-propylamine	3.1	ug/L	-	-	-	-	-	-	-	-			
19	Naphthalene	1.6	ug/L	-	-	-	-	-	-	-	-			
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	-	-	-	-	-	-	-	-			
20	2,3,4-Trichlorophenol	0.6	ug/L	-	-	-	-	-	-	-	-			
20	Phenol	2.4	ug/L	-	-	-	-	-	-	-	-			
23	1,2,4,5-Tetrachiorobenzene	10.0	ng/L	7.0	*	7.0	*	7.0	*	7.0	*	DowS	DowS	DowS
23	1,2,4-Trichlorobenzene	10.0	ng/L	17.9	0.001	17.9	0.001	17.9	0.001	17.9	0.001	DowS	DowS	DowS
23	2,4,5-Trichlorotoluene	10.0	ng/L	9.2	0.001	9.2	0.001	9.2	0.001	9.2	0.001	DowS	DowS	DowS
23	Hexachlorobenzene	10.0	ng/L	7.9	*	7.9	*	7.9	*	7.9	*	DowS	DowS	DowS
23	Hexachlorobutadiene	10.0	ng/L	12.2	*	12.2	*	12.2	*	12.2	*	DowS	DowS	DowS
23	Hexachlorocyclopentadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DowS	DowS	DowS
23	Hexachloroethane	10.0	ng/L	6.5	*	6.5	*	6.5	*	6.5	*	DowS	DowS	DowS
23	Octachlorostyrene	10.0	ng/L	9.2	0.001	9.2	0.001	9.2	0.001	9.2	0.001	DowS	DowS	DowS
24	Total TCDF	15.0	pg/L	-	-	-	-	-	-	-	-			
24	Total PCDD	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total PCDF	15.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H6CDD	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H6CDF	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H7CDD	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H7CDF	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Octachlorodibenzofuran	30.0	pg/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	1.9	108.017	1.9	108.017	1.9	108.017	1.9	108.017	DowS	DowS	DowS

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC. - SARNIA

OT 1000 - 5th Street Outfall to River
AVERAGE FLOWRATE = 13238 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	0.32	4.258	0.32	4.258	0.32	4.258	0.32	4.258	DowS	DowS	DowS
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	2.1	27.238	2.1	27.238	2.1	27.238	2.1	27.238	DowS	DowS	DowS
5	TOC	5	mg/L	2	25.634	2	25.634	2	25.634	2	25.634	DowS	DowS	DowS
6	Total phosphorus	0.10	mg/L	0.09	1.109	0.09	1.109	0.09	1.109	0.09	1.109	DowS	DowS	DowS
8	Total suspended solids	5	mg/L	14	171.326	14	171.326	14	171.326	14	171.326	DowS	DowS	DowS
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	-	-	-	-	-	-	-	-			
9	Boron	50.0	ug/L	-	-	-	-	-	-	-	-			
9	Chromium	20.0	ug/L	-	-	-	-	-	-	-	-			
9	Copper	10.0	ug/L	-	-	-	-	-	-	-	-			
9	Lead	30.0	ug/L	-	-	-	-	-	-	-	-			
9	Molybdenum	20.0	ug/L	-	-	-	-	-	-	-	-			
9	Nickel	20.0	ug/L	-	-	-	-	-	-	-	-			
9	Vanadium	30.0	ug/L	-	-	-	-	-	-	-	-			
9	Zinc	10.0	ug/L	-	-	-	-	-	-	-	-			
12	Mercury	0.10	ug/L	0.10	0.001	0.10	0.001	0.10	0.001	0.10	0.001	DowS	DowS	DowS
14	Phenolics (4AAP)	2.0	ug/L	5.6	0.073	5.6	0.073	5.6	0.073	5.6	0.073	DowS	DowS	DowS
15	Sulphide	20.0	ug/L	-	-	-	-	-	-	-	-			
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.8	0.011	0.8	0.011	0.8	0.011	0.8	0.011	DowS	DowS	DowS
16	1,1,2-Trichloroethane	0.6	ug/L	0.3	0.004	0.3	0.004	0.3	0.004	0.3	0.004	DowS	DowS	DowS
16	1,1-Dichloroethane	0.8	ug/L	0.3	0.004	0.3	0.004	0.3	0.004	0.3	0.004	DowS	DowS	DowS
16	1,1-Dichloroethylene	2.8	ug/L	0.5	0.006	0.5	0.006	0.5	0.006	0.5	0.006	DowS	DowS	DowS
16	1,2-Dichloroethane	0.8	ug/L	9.0	0.114	9.0	0.114	9.0	0.114	9.0	0.114	DowS	DowS	DowS
16	1,2-Dichloropropane	0.9	ug/L	0.8	0.012	0.8	0.012	0.8	0.012	0.8	0.012	DowS	DowS	DowS
16	Bromodichloromethane	0.8	ug/L	0.3	0.004	0.3	0.004	0.3	0.004	0.3	0.004	DowS	DowS	DowS
16	Bromoform	3.7	ug/L	0.6	0.008	0.6	0.008	0.6	0.008	0.6	0.008	DowS	DowS	DowS
16	Carbon tetrachloride	1.3	ug/L	1.3	0.017	1.3	0.017	1.3	0.017	1.3	0.017	DowS	DowS	DowS
16	Chloroform	0.7	ug/L	0.8	0.010	0.8	0.010	0.8	0.010	0.8	0.010	DowS	DowS	DowS
16	Chloromethane	3.7	ug/L	3.5	0.042	3.5	0.042	3.5	0.042	3.5	0.042	DowS	DowS	DowS
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.006	0.5	0.006	0.5	0.006	0.5	0.006	DowS	DowS	DowS

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DOW CHEMICAL CANADA INC - SARNIA

OT 1000 - 5th Street Outfall to River
AVERAGE FLOWRATE = 13238 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Dibromochloromethane	1.1	ug/L	0 5	0.006	0.5	0.006	0.5	0.006	0.5	0.006	DowS	DowS	DowS
16	Methylene chloride	1.3	ug/L	0.4	0.006	0.4	0 006	0.4	0.006	0.4	0.006	DowS	DowS	DowS
16	Tetrachloroethylene	1.1	ug/L	3.0	0.039	3.0	0.039	3.0	0 039	3 0	0 039	DowS	DowS	DowS
16	Trichloroethylene	1.9	ug/L	0.5	0.006	0.5	0.006	0.5	0.006	0.5	0.006	DowS	DowS	DowS
16	Vinyl chloride	4.0	ug/L	1.4	0.018	1.4	0.018	1.4	0.018	1.4	0.018	DowS	DowS	DowS
17	Benzene	0.5	ug/L	0.2	0.003	0.2	0.003	0.2	0.003	0.2	0.003	DowS	DowS	DowS
17	Ethylbenzene	0.6	ug/L	0.4	0.005	0.4	0.005	0.4	0.005	0.4	0.005	DowS	DowS	DowS
17	Styrene	0.5	ug/L	0.4	0.005	0.4	0.005	0.4	0.005	0.4	0 005	DowS	DowS	DowS
17	m-Xylene and p-Xylene	1.1	ug/L	0.7	0.009	0.7	0 009	0.7	0.009	0.7	0.009	DowS	DowS	DowS
17	o-Xylene	0.5	ug/L	0.4	0.005	0.4	0.005	0 4	0.005	0.4	0.005	DowS	DowS	DowS
19	2,6-Dinitrotoluene	0.7	ug/L	-	-	-	-	-	-	-	-			
19	2-Chloronaphthalene	1.8	ug/L	-	-	-	-	-	-	-	-			
19	Benzylbutylphthalate	0.6	ug/L	-	-	-	-	-	-	-	-			
19	Biphenyl	0.6	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-chloroethyl)ether	4.4	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-chloroisopropyl)ether	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Di-n-butyl phthalate	3.8	ug/L	-	-	-	-	-	-	-	-			
19	N-Nitrosodi-n-propylamine	3.1	ug/L	-	-	-	-	-	-	-	-			
19	Naphthalene	1.6	ug/L	-	-	-	-	-	-	-	-			
20	2,3,4,5-Tetrachlorophenol	0.4	ug/L	0.4	0.005	0.4	0.005	0.4	0.005	0.4	0.005	DowS	DowS	DowS
20	2,3,4-Trichlorophenol	0.6	ug/L	0.2	0.003	0.2	0.003	0.2	0.003	0.2	0.003	DowS	DowS	DowS
20	Phenol	2.4	ug/L	2.4	0.031	2.4	0.031	2.4	0.031	2.4	0.031	DowS	DowS	DowS
23	1,2,4,5-Tetrachlorobenzene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	1,2,4-Trichlorobenzene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	2,4,5-Trichlorotoluene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachlorobenzene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachlorobutadiene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachlorocyclopentadiene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachloroethane	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Octachlorostyrene	10.0	ng/L	-	-	-	-	-	-	-	-			
24	Total TCDF	15.0	pg/L	-	-	-	-	-	-	-	-			
24	Total PCDD	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total PCDF	15 0	pg/L	-	-	-	-	-	-	-	-			
24	Total H6CDD	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H6CDF	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H7CDD	30 0	pg/L	-	-	-	-	-	-	-	-			
24	Total H7CDF	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Octachlorodibenzofuran	30 0	pg/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1 0	mg/L	1 1	13 878	1 1	13 878	1 1	13 878	1 1	13 878	DowS	DowS	DowS

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant.No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

DU PONT CANADA INC. - CORUNNA

1.0 PLANT DESCRIPTION

The Du Pont Canada Inc., St. Clair River site is located in the Town of Corunna, just south of Sarnia. Du Pont Canada Inc. produces a complete range of low to high density linear polyethylene resins, manufactured using a low pressure cyclohexane solution process with ethylene and butene/octene. The process used at Du Pont is a modified Ziegler process. There are approximately 270 employees. The plant operates 24 hours per day, 50 to 52 weeks per year.

There are three MISA sampling locations. At MISA Control Point IN 0100, the in-take water or raw St. Clair River water, is sampled. At MISA Control Point CO 0200, the final effluent, which is a combination of stormwater, cooling water, boiler blowdown and processing water, is sampled. At MISA Control Point CO 0400, the pellet pond effluent, which is a mixture of all stormwater from developed and undeveloped areas, once-through cooling water and process water from non-hydrocarbon process areas, and boiler blowdown from the powerhouse, is sampled.

Currently, the wastewater treatment system consists of two skimming ponds to remove pellets and insoluble hydrocarbons. Highly contaminated wastewater is separated before entering the wastewater treatment facility and disposed of off-site.

Details on the plant processes, water uses, and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

In the process area and storage areas, there are three sewer systems: the flooded sewer system and the overhead sewer system which service the Polymer Area buildings and the storm sewer system. All of the sewers are combined in the developed area of the plant site; there is only one direct plant outfall to the St. Clair River (MISA Control Point CO 0200).

The distinction between the overhead sewer system and the flooded sewer system is the source of the wastewater in the sewer. The overhead sewer contains once-through, non-contact cooling water from condensers on high pressure distillation columns. The overhead sewers are connected to a disengaging drum. Here, the volatiles that may build up in the vapour space are vented to the flare stack. The wastewater drawn off the bottom of the disengaging drum is directed to the collection box. The flooded sewer system is used to collect all other wastewater streams from the hydrocarbon processing area other than stormwater (i.e., any water collected outside the curbed areas). The wastewater from the flooded sewer system is mixed with the wastewater from the overhead sewer system at the collection box, before being discharged to the final skimming pond. Because this combined stream should not normally have any contamination from resin, the pellet pond is bypassed.

The storm sewer system is used to collect all wastewater generated in the finishing area and the modified polymer area, all surface runoff from within the fenced plant boundaries including the parking lots, the main road, the rail yard and the landscaped areas. This wastewater is directed, via the storm sewers, to the pellet pond before it is discharged into the final skimming pond. The surface water is collected in open ditches (in the outer areas) and closed storm sewers in the processing areas. In addition, some of the undeveloped surrounding areas are drained by the plant system.

The sources of wastewater in the various sewers are presented in Table 1.0.

TABLE 1.0
SEWER SEGREGATION

Type of Sewer	Description	Process Area	Flow Source	Treatment
Combined	Flooded sewer system	Process Area	· Non-contact, once-through cooling water · Equipment and area washwater · Washwater column · Decanters	· Final skimming pond
Cooling Water	Overhead system	Process Area	· Non-contact, once-through cooling water	· Disengaging drum · Final skimming pond

TABLE 1.0 SEWER SEGREGATION				
Type of Sewer	**Description**	**Process Area**	**Flow Source**	**Treatment**
Combined	Storm sewer system	Finishing area Modified polymer area Powerhouse	· Once-through, non-contact cooling water · Cutter water · Blender/stripper condensate · Spin drier · Equipment washwater · Boiler blowdown and backwash · Vacuum pump neutralization tank effluent · Stormwater from site outside curbed process area	· Pellet recovery pond · Final skimming pond

The sources of wastewater reaching each of the MISA Control Points are presented in Table 2.0. The flows at MISA Control Point CO 0200 are a combination of the flows at CO 0400 and the effluent from the Collection Box (flooded sewer system plus overhead sewer system).

TABLE 2.0 MISA CONTROL POINT WASTEWATER SOURCES	
Control Point	**Contributing Sources**
CO 0400	Pellet removal pond effluent - Stormwater - Boiler Blowdown - Water from Non-Hydrocarbon Processing Areas
CO 0200	Collection box effluent Pellet removal pond effluent (CO 0400)

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points CO 0200 and CO 0400.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of Environment for the MISA Twelve Month Monitoring Period indicated that the plant's effluent's were not acutely lethal. Based on these results, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION II

This BAT option incorporates the best available technologies from similar U.S. and Ontario plants that, if installed, will achieve the maximum overall pollutant reduction. Analytical results obtained for the MISA OCM Sector Twelve Month Report indicates current pollutant discharge levels are as low or lower than discharge levels at similar U.S. or Ontario plants with the exception of 08CDD at MISA Control Point CO 0400. The average concentration of 08CDD at CO 0400 during the MISA Twelve Month Monitoring Period was 59 pq/l.

Based on the data, it is evident that quality of the plant's discharges is well within other comparable plants in the U.S. and Ontario; therefore, no additional technology is recommended with the exception of the development and implementation of a Best Management Practice (BMP) Plan related to the identification of the source and methods of control of 08CDD at MISA Monitoring Point CO 0400. A draft report

prepared by Environment Canada provides guidelines for development and implementation of BMP plans (Ref. 2).

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. Based on the levels of contaminants that are currently present, multimedia filtration is recommended for MISA Control Point CO 0400. With the application of this technology, the levels of contaminants currently present at CO 0400 will be further reduced. Since the major source of contamination for MISA Control Point CO 0200 originates from the pellet pond effluent (CO 0400) and with the reduction of contaminants that will be achieved with the technologies proposed for that discharge, no additional treatment is recommended at MISA Control Point CO 0200 for BAT Option 3.

3.4 SUMMARY OF BAT OPTIONS

The following table presents a summary of the BAT options recommended for Du Pont Corunna Plant.

TABLE 3.0
SUMMARY OF BAT OPTIONS FOR DU PONT CANADA - CORUNNA

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-lethal effluents	No additional treatment
2	USA/Ontario BAT/ Maximum Pollutant Reduction	CO 0200: No additional treatment CO 0400: BMP's for 08CDD
3	Zero Discharge/Virtual Elimination	CO 0200: No additional treatment CO 0400: Multimedia Filtration

4.0 BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste- specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Du Pont, Corunna were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibres Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 3).

Table 4.0 presents the cost estimates for the technologies selected for each BAT Options for Du Pont, Corunna. The only cost estimates are for multimedia filtration at MISA Control Point CO 0400 for BAT Option 3. Cost estimates for development and implementation of a BMP Plan could not be developed due to the site-specific nature of the plan.

TABLE 4.0
BAT OPTION MODEL COST ESTIMATES
DUPONT CANADA INC. - CORUNNA

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
CO 0200	66,590	0	0	NAT	0	0	NAT	0	0	NAT
CO 0400	20,883	0	0	NAT	NA	NA	BMP's	2,098,000	133,900	FIL

NOTES:

NAT - No additional treatment
BMP's - Best Management Practices
FIL - Multimedia Filtration
NA - Not available

6.0 REFERENCES

1. DuPont Canada Inc. - Corunna - BAT status of OCM Sector Plants Site Visit Information Report, April 17, 1991.

2. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMP's) and Their Application to Ontario's MISA Program", May 1987.

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA
FOR DU PONT CANADA INC. - CORUNNA

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – CORUNNA

ATG	PARAMETER	RMDL	UNIT	IN 0100	CO 0200	CO 0400
1	COD	10	mg/L	16	23	48
2	Cyanide Total	0.005	mg/L	0.001	0.001	0.001
3	Hydrogen ion (pH)			8.0	7.9	8.0
4	Ammonia plus Ammonium	0.25	mg/L	0.12	0.08	0.03
4	Nitrate+Nitrite	0.25	mg/L	0.33	0.36	0.39
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	0.5	0.4
5	DOC	0.5	mg/L	2.5	3.0	2.8
5	TOC	5	mg/L	2	5	4
6	Total phosphorus	0.10	mg/L	0.08	0.08	0.10
7	Specific conductance	5	uS/cm	269	282	309
8	Total suspended solids	5	mg/L	6	7	12
8	Volatile suspended solids	10	mg/L	4	7	10
9	Aluminum	30.0	ug/L	142.6	220.8	223.2
9	Copper	10.0	ug/L	13.6	23.2	25.7
9	Zinc	10.0	ug/L	6.6	11.4	19.2
14	Phenolics (4AAP)	2.0	ug/L	1.5	2.7	2.8
15	Sulphide	20.0	ug/L	25.0	25.0	40.0
16	1,1–Dichloroethane	0.8	ug/L	1.2	0.5	0.5
16	1,2–Dichloroethane	0.8	ug/L	0.7	0.4	0.4
16	Chloroform	0.7	ug/L	0.4	0.6	1.4
16	Chloromethane	3.7	ug/L	4.3	2.3	2.3
16	Methylene chloride	1.3	ug/L	0.3	2.3	4.3
17	Toluene	0.5	ug/L	0.4	3.1	5.2
23	Hexachlorobenzene	10.0	ng/L	4.0	6.5	7.5
23	Hexachloroethane	10.0	ng/L	1.7	1.7	11.9
23	Pentachlorobenzene	10.0	ng/L	3.6	5.1	10.1
24	Total H7CDD	30.0	pg/L	17.0	27.5	52.0
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	20.0	25.5	59.0
25	Oil and grease	1.0	mg/L	1.3	1.3	1.5
98	Ftflow		m3/day	49316	54696	15088

EXPLANATORY NOTES:
(i) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(ii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0100 – Intake Water to Site
CO 0200 – Final Effluent to River
CO 0400 – Pellet Pond Effluent flows into CO 0200

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – CORUNNA

ATG	PARAMETER	IN 0100	CO 0200	CO 0400	TOTAL
1	COD	968.000	1389.400	541.410	1389.400
2	Cyanide Total	0.029	0.029	0.005	0.029
4	Ammonia plus Ammonium	6.315	4.356	0.293	4.356
4	Nitrate+Nitrite	19.625	21.696	4.574	21.696
4	Total Kjeldahl Nitrogen	27.702	25.258	4.899	25.258
5	DOC	128.617	153.469	37.651	153.469
5	TOC	145.571	189.898	51.382	189.898
6	Total phosphorus	4.579	4.212	1.352	4.212
8	Total suspended solids	342.071	351.317	173.148	351.317
8	Volatile suspended solids	210.700	419.000	110.050	419.000
9	Aluminum	8.178	12.582	3.030	12.582
9	Copper	0.842	1.439	0.438	1.439
9	Zinc	0.377	0.637	0.234	0.637
14	Phenolics (4AAP)	0.081	0.136	0.040	0.136
15	Sulphide	1.517	1.517	0.470	1.517
16	1,1–Dichloroethane	0.073	0.030	0.006	0.030
16	1,2–Dichloroethane	0.039	0.024	0.005	0.024
16	Chloroform	0.024	0.033	0.015	0.033
16	Chloromethane	0.261	0.138	0.027	0.138
16	Methylene chloride	0.018	0.131	0.049	0.131
17	Toluene	0.023	0.171	0.091	0.171
23	Hexachlorobenzene	*	0.001	*	0.001
23	Hexachloroethane	*	*	*	*
23	Pentachlorobenzene	*	*	*	*
24	Total H7CDD	*	*	*	*
24	Octachlorodibenzo–p–dioxin	*	*	*	*
25	Oil and grease	68.542	71.391	22.033	71.391

EXPLANATORY NOTES:
(i) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0100 – Intake Water to Site
CO 0200 – Final Effluent to River
CO 0400 – Pellet Pond Effluent flows into CO 0200

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS FOR DU PONT CANADA INC. - CORUNNA

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - CORUNNA

CONTROL POINT - CO 0200 Final Effluent to River
AVERAGE FLOWRATE = 54696 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	23	1389.400	23	1389.400	23	1389.400	23	1389.400	DupC	DupC	DupC
2	Cyanide Total	0.005	mg/L	0.001	0.029	0.001	0.029	0.001	0.029	0.001	0.029	DupC	DupC	DupC
4	Ammonia plus Ammonium	0.25	mg/L	0.08	4.356	0.08	4.356	0.08	4.356	0.08	4.356	DupC	DupC	DupC
4	Nitrate+Nitrite	0.25	mg/L	0.36	21.696	0.36	21.696	0.36	21.696	0.36	21.696	DupC	DupC	DupC
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	25.258	0.5	25.258	0.5	25.258	0.5	25.258	DupC	DupC	DupC
5	DOC	0.5	mg/L	3.0	153.469	3.0	153.469	3.0	153.469	3.0	153.469	DupC	DupC	DupC
5	TOC	5	mg/L	5	189.898	5	189.898	5	189.898	5	189.898	DupC	DupC	DupC
6	Total phosphorus	0.10	mg/L	0.08	4.212	0.08	4.212	0.08	4.212	0.08	4.212	DupC	DupC	DupC
8	Total suspended solids	5	mg/L	7	351.317	7	351.317	7	351.317	7	351.317	DupC	DupC	DupC
8	Volatile suspended solids	10	mg/L	7	419.000	7	419.000	7	419.000	7	419.000	DupC	DupC	DupC
9	Aluminum	30.0	ug/L	220.8	12.582	220.8	12.582	220.8	12.582	220.8	12.582	DupC	DupC	DupC
9	Copper	10.0	ug/L	23.2	1.439	23.2	1.439	23.2	1.439	23.2	1.439	DupC	DupC	DupC
9	Zinc	10.0	ug/L	11.4	0.637	11.4	0.637	11.4	0.637	11.4	0.637	DupC	DupC	DupC
14	Phenolics (4AAP)	2.0	ug/L	2.7	0.136	2.7	0.136	2.7	0.136	2.7	0.136	DupC	DupC	DupC
15	Sulphide	20.0	ug/L	25.0	1.517	25.0	1.517	25.0	1.517	25.0	1.517	DupC	DupC	DupC
16	1,1-Dichloroethane	0.8	ug/L	0.5	0.030	0.5	0.030	0.5	0.030	0.5	0.030	DupC	DupC	DupC
16	1,2-Dichloroethane	0.8	ug/L	0.4	0.024	0.4	0.024	0.4	0.024	0.4	0.024	DupC	DupC	DupC
16	Chloroform	0.7	ug/L	0.6	0.033	0.6	0.033	0.6	0.033	0.6	0.033	DupC	DupC	DupC
16	Chloromethane	3.7	ug/L	2.3	0.138	2.3	0.138	2.3	0.138	2.3	0.138	DupC	DupC	DupC
16	Methylene chloride	1.3	ug/L	2.3	0.131	2.3	0.131	2.3	0.131	2.3	0.131	DupC	DupC	DupC
17	Toluene	0.5	ug/L	3.1	0.171	3.1	0.171	3.1	0.171	3.1	0.171	DupC	DupC	DupC
23	Hexachlorobenzene	10.0	ng/L	6.5	0.001	6.5	0.001	6.5	0.001	6.5	0.001	DupC	DupC	DupC
23	Hexachloroethane	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	DupC	DupC	DupC
23	Pentachlorobenzene	10.0	ng/L	5.1	*	5.1	*	5.1	*	5.1	*	DupC	DupC	DupC
24	Total H7CDD	30.0	pg/L	27.5	*	27.5	*	27.5	*	27.5	*	DupC	DupC	DupC
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	25.5	*	25.5	*	25.5	*	25.5	*	DupC	DupC	DupC
25	Oil and grease	1.0	mg/L	1.3	71.391	1.3	71.391	1.3	71.391	1.3	71.391	DupC	DupC	DupC

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - CORUNNA

CONTROL POINT - CO 0400 Pellet Pond Effluent flows into CO 0200
AVERAGE FLOWRATE = 15088 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	48	541.410	48	541.410	48	541.410	48	541.410	DupC	DupC	DupC
2	Cyanide Total	0.005	mg/L	0.001	0.005	0.001	0.005	0.001	0.005	0.001	0.005	DupC	DupC	DupC
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.293	0.03	0.293	0.03	0.293	0.03	0.293	DupC	DupC	DupC
4	Nitrate+Nitrite	0.25	mg/L	0.39	4.574	0.39	4.574	0.39	4.574	0.39	4.574	DupC	DupC	DupC
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.4	4.899	0.4	4.899	0.4	4.899	0.4	4.899	DupC	DupC	DupC
5	DOC	0.5	mg/L	2.8	37.651	2.8	37.651	2.8	37.651	2.8	37.651	DupC	DupC	DupC
5	TOC	5	mg/L	4	51.382	4	51.382	4	51.382	4	51.382	DupC	DupC	DupC
6	Total phosphorus	0.10	mg/L	0.10	1.352	0.10	1.352	0.10	1.352	0.10	1.352	DupC	DupC	DupC
8	Total suspended solids	5	mg/L	12	173.148	12	173.148	12	173.148	5	75.440	DupC	DupC	P1774
8	Volatile suspended solids	10	mg/L	10	110.050	10	110.050	10	110.050	5	75.440	DupC	DupC	P1774
9	Aluminum	30.0	ug/L	223.2	3.030	223.2	3.030	223.2	3.030	47.0	0.709	DupC	DupC	RREL
9	Copper	10.0	ug/L	25.7	0.438	25.7	0.438	25.7	0.438	25.7	0.438	DupC	DupC	DupC
9	Zinc	10.0	ug/L	19.2	0.234	19.2	0.234	19.2	0.234	19.2	0.234	DupC	DupC	DupC
14	Phenolics (4AAP)	2.0	ug/L	2.8	0.040	2.8	0.040	2.8	0.040	2.8	0.040	DupC	DupC	DupC
15	Sulphide	20.0	ug/L	40.0	0.470	40.0	0.470	40.0	0.470	40.0	0.470	DupC	DupC	DupC
16	1,1-Dichloroethane	0.8	ug/L	0.5	0.006	0.5	0.006	0.5	0.006	0.5	0.006	DupC	DupC	DupC
16	1,2-Dichloroethane	0.8	ug/L	0.4	0.005	0.4	0.005	0.4	0.005	0.4	0.005	DupC	DupC	DupC
16	Chloroform	0.7	ug/L	1.4	0.015	1.4	0.015	1.4	0.015	1.4	0.015	DupC	DupC	DupC
16	Chloromethane	3.7	ug/L	2.3	0.027	2.3	0.027	2.3	0.027	2.3	0.027	DupC	DupC	DupC
16	Methylene chloride	1.3	ug/L	4.3	0.049	4.3	0.049	4.3	0.049	4.3	0.049	DupC	DupC	DupC
17	Toluene	0.5	ug/L	5.2	0.091	5.2	0.091	5.2	0.091	5.2	0.091	DupC	DupC	DupC
23	Hexachlorobenzene	10.0	ng/L	7.5	*	7.5	*	7.5	*	7.5	*	DupC	DupC	DupC
23	Hexachloroethane	10.0	ng/L	11.9	*	11.9	*	11.9	*	11.9	*	DupC	DupC	DupC
23	Pentachlorobenzene	10.0	ng/L	10.1	*	10.1	*	10.1	*	10.1	*	DupC	DupC	DupC
24	Total H7CDD	30.0	pg/L	52.0	*	52.0	*	52.0	*	52.0	*	DupC	DupC	DupC
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	59.0	*	59.0	*	59.0	*	59.0	*	DupC	DupC	DupC
25	Oil and grease	1.0	mg/L	1.5	22.033	1.5	22.033	1.5	22.033	1.5	22.033	DupC	DupC	DupC

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

DU PONT CANADA INC. - KINGSTON SITE

1.0 PLANT DESCRIPTION

The Du Pont Plant in Kingston, Ontario was built in 1941 to produce nylon. After the war, the existing plant was expanded. This included construction of the Research Centre and the Customer Technical Centre in Kingston. Now, more than 1,800 employees work at the Kingston complex. The plant operates twenty four hours per day (two 12 hour shifts), seven days a week. There are no seasonal shut-downs.

The production of nylon consists of the following operations:

- nylon salt strike
- evaporation
- polymerization
- nylon flake casting
- spinning
- nylon staple processing
- beaming
- winding
- wrapping

The finished product, nylon, is shipped to the textile industry and other users as monofilament yarn, multifilament yarn, nylon staple fibre and nylon resin. Depending on the customer, different finishes are applied to the product to achieve desired properties. The Du Pont nylon products are used to manufacture various types of fabric, carpets, automotive parts made of nylon resin and other products.

The only existing treatment facilities at the Du Pont Kingston Plant are a catch tank and a trickling filter.

Details on the plant processes, water uses, wastewater generation and management are presented in the BAT site visit report (Ref. 1)

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

There are two direct effluent discharge points from the plant to Lake Ontario: a) Catch Tank Effluent (MISA Control Point CO 1100), and b) Service Sewer Effluent (MISA Control Point CO 0700).

The Catch Tank receives wastewater from two sewer systems:

- North process sewer system, which collects non-contact cooling and air conditioning water from different production areas, the power house, and salt storage area. This system also collects stormwater runoff from roofs and paved areas in the north part of the plant.

- South process sewer system, which collects non-contact cooling water from different production areas, stormwater from roofs and paved areas in the central and east part of the plant. In addition, this system collects contact spray water from the nylon flake area (MISA Control Point PR 0600) and wastewater contaminated with finish oils washed off from the yarn in the staple fibre processing area (MISA Control Point PR 1000).

The Service Sewer, which discharges to Lake Ontario through MISA Control Point CO 0700, receives non-contact cooling and air conditioning water from some processing areas and stormwater runoff from roofs and paved areas in the South part of the plant.

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 0600, PR 1000, CO 0700, and CO 1100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector Plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario Plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Report were determined to have been acutely lethal to Daphnia Magna and Rainbow Trout at MISA Control Points CO 0700 and CO 1100.

A review of the matching analytical chemistry monitoring data for MISA Control Points CO 0700 and CO 1100 did not reveal any probable causes of the observed acute toxicity. Most of the contaminants found in CO 0700 and CO 1100 during the MISA monitoring period were at or below the detection levels.

Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Points C0 0700 and C0 1100 to assess the toxicity problems identified. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 2).

3.2 BAT OPTION 2

BAT Option 2 includes the best available technologies selected by the U.S. EPA for comparable facilities in the U.S. and/or technologies currently used by other Ontario OCM Sector plants that, if installed, will achieve the maximum overall pollutant reduction.

3.2.1 PR 1000 - Staple Sewer

During the nylon staple processing, the finishing oils previously applied to the yarn (spinning) are washed off using a water spray. Wastewater resulting from this operation is discharged through the MISA Control Point PR 1000 to the Catch Tank. A review of the six month monitoring data from PR 1000 revealed elevated levels of DOC (159.3 mg/l), TOC (204 mg/l), COD (1180 mg/l), oil and grease (250.3 mg/l), phenolics (233.9 ug/l), and TSS (68 mg/l). Demonstrated technologies for the removal of these contaminants identified in similar U.S. and Ontario organic manufacturing plants include oil separation, equalization, biological treatment (activated sludge), and secondary clarification.

3.2.2 PR 0600 - Flake Effluent

The contact spray water from the nylon flake casting operation is discharged to the Catch Tank through MISA Control Point PR 0600. A review of the monitoring data from MISA Control Point PR 0600 revealed generally low levels of contaminants.

From the monitoring data, it does not appear that significant levels of any contaminants are being contributed to the effluent from the nylon flake casting operations with the exception of Dowtherm® leakage and contamination. A Best Management Practices (BMP) plan is recommended for identification of sources and methods of control for the Dowtherm® leakage. A draft report prepared by Environment Canada provides guidelines for developing a Best Management Practices (BMP) plan (Ref. 3).

3.2.3 CO 0700 - Service Sewer to Lake

As indicated previously, the Service Sewer (CO 0700) collects non-contact cooling and air conditioning water and stormwater runoff from roofs and paved areas in the south part of the plant and discharges to Lake Ontario without any treatment.

Monitoring data collected during the MISA Twelve Month Monitoring Period at CO 0700 show low levels of contaminants being discharged with the possible exception of COD (25.75 mg/l). A BMP study is also recommended for MISA Control Point CO 0700 to identify the source(s) and methods of control for COD at this MISA Control Point.

3.2.4 CO 1100 - Catch Tank Effluent to Lake

As indicated previously, contact and non-contact cooling water, process wastewater and stormwater runoff are collected in common sewers and directed to the Catch Tank which discharges to Lake Ontario (CO 1100). Monitoring data collected in the MISA Twelve Month Monitoring Period for CO 1100 showed little or no contamination. Most contaminants were present at or below detection levels. The most contaminated stream that flows into the Catch Tank is the effluent from the nylon staple processing area (PR 0100). With the removal of contaminants by the technologies recommended for PR 1000 under BAT Option 2, it is expected that the final effluent from the Catch Tank will show no contamination. Therefore, no additional treatment is recommended at the present time for CO 1100 under this BAT option.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. A search which included any current technology or combination of current technologies including supplemental/ add-on technologies or cross-over technologies from other industrial sectors was carried out as part of this study. Based on the

contaminants present in the plant effluents and the results of this search, the technologies presented in Table 1.0 are recommended for each effluent point which would result in the advancement toward virtual elimination and the ultimate goal of zero discharge of contaminants.

TABLE 1.0	
MISA CONTROL POINT	**TECHNOLOGY RECOMMENDED**
PR 1000	Granular Activated Carbon/Multimedia Filtration
PR 0600	Granular Activated Carbon/Multimedia Filtration
CO 0700	No additional treatment
CO 1100	No additional treatment

It should be noted that the technologies recommended for BAT Option 3 are in addition to any recommendations for BAT Options 1 and 2.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the technologies or actions recommended for each BAT Option for the Du Pont Kingston Plant.

TABLE 2.0 SUMMARY OF BAT OPTIONS FOR DU PONT CANADA - KINGSTON SITE		
BAT OPTION		
1	CO 0700:	Toxicity Investigation Evaluation Study (TIE)
	CO 1100:	TIE
2	PR 1000:	Oil separation, equalization, activated sludge, secondary clarification
	PR 0600:	Best Management Practices (BMP) plan for Dowtherm™
	CO 0700:	BMP plan for COD and Dowtherm™
	CO 1100:	BMP plan for Dowtherm™
3	PR 1000:	BAT Option 2 plus Granular Activated Carbon and Multimedia Filtration
	PR 0600:	Granular Activated Carbon and Multimedia Filtration
	CO 0700:	Same as BAT Option 2
	CO 1100:	Same as BAT Option 2

4.0 PERFORMANCE DATA FOR BAT OPTIONS

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT Option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT option. All costs presented are based upon 1991 Canadian dollars and represent capital investment as well as annual operating and maintenance (O&M) cost. The cost estimates do not include land cost since the cost of land is almost exclusively dependent on site- specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending on site-specific or waste-specific considerations, actual costs may be higher or lower.

The sources of the cost estimates associated with the control technologies consider for Du Pont Canada Inc. - Kingston site are presented below in Table 3.0.

TABLE 3.0

BAT TECHNOLOGY	SOURCE FOR COST ESTIMATES
Activated Sludge / Secondary Clarification / Granular Activated Carbon (GAC) / Multimedia Filtration	Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category. EPA 440/1-87/009 October 1987 (Ref. 4).
Equalization	CAPDET Computer Program
Oil Separation	Obtained from Vendor Quotes

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting costs. Annual operating costs include maintenance and operating labor, power and energy consumption, chemicals, materials, taxes and insurance and administrative costs.

Table 4.0 presents technology-by-technology cost estimates for the technologies recommended for each BAT Option for the Du Pont, Kingston Plant.

6.0 REFERENCES

1. Du Pont Canada Inc. Kingston BAT status of the OCM Sector Plants Site Visit Information Report, April 3, 1991.

2. Technical Support Document for Water Quality-based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluation" (EPA 505/2-90-001, March 1991).

3. J.S. Shrives, Oil, Gas and Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Application to Ontario's MISA Program", May 1987.

4. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fiber Point Source Category EPA 440/1-87/009, October, 1987.

TABLE 4.0
BAT OPTION MODELS COST ESTIMATES-DUPONT KINGSTON

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 2			BAT OPTION 3		
		CAPITAL COST	O&M COST	TECHNOLOGY	CAPITAL	O&M COST	TECHNOLOGY
PR 1000	189	643,400*	73,800	Activated Sludge/ Secondary Clarifier	923,700	114,300	Option 2
		212,500	NA	Oil Separation	429,400	244,400	GAC
		67,800	40,500	Equalization	434,000	39,800	FIL
		923,700	114,300		1,787,100	398,500	TOTAL
PR 0600	1,223	NA	NA	BMP	641,300	57,500	FIL
					1,777,500	1,425,100	GAC
					2,418,800	1,482,600	TOTAL
CO 0700	38,504	NA	NA	BMP	NA	NA	BMP
CO 1100	29,069	NA	NA	BMP	NA	NA	BMP

NOTES:

- * Includes cost for sludge handling and disposal
- NA Not Available
- GAC Granular Activated Carbon
- FIL Multimedia Filtration
- BMP Best Management Practices Plan

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR DU PONT CANADA - KINGSTON

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – KINGSTON

ATG	PARAMETER	RMDL	UNIT	IN 1300	PR 0600	PR 1000	CO 0700	CO 1100
1	COD	10	mg/L	–	16.75	180	25.75	31
2	Cyanide Total	0.005	mg/L	–	0.005	0.005	0.005	0.005
3	Hydrogen ion (pH)			8.0	8.2	7.6	8.2	8.2
4	Ammonia plus Ammonium	0.25	mg/L	–	0.21	0.36	0.15	0.77
4	Nitrate+Nitrite	0.25	mg/L	–	0.25	0.09	0.26	0.29
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	1.1	5.5	1.5	1.1
5	DOC	0.5	mg/L	2.0	5.0	159.3	4.2	6.7
5	TOC	5	mg/L	2	7	204	6	4
6	Total phosphorus	0.10	mg/L	0.10	0.22	2.90	0.12	0.27
7	Specific conductance	5	uS/cm	315	321	329	328	353
8	Total suspended solids	5	mg/L	7	11	68	5	8
8	Volatile suspended solids	10	mg/L	–	5	120	5	4
9	Aluminum	30.0	ug/L	59.2	44.8	39.4	39.0	42.8
9	Boron	50.0	ug/L	60.0	53.3	93.3	56.7	63.3
9	Copper	10.0	ug/L	63.3	22.5	19.2	10.8	16.7
9	Zinc	10.0	ug/L	133.3	12.5	35.2	10.0	27.5
12	Mercury	0.10	ug/L	–	0.17	0.11	0.10	0.10
14	Phenolics (4AAP)	2.0	ug/L	1.2	1.1	233.9	1.3	1.7
15	Sulphide	20.0	ug/L	10.0	10.0	57.3	10.0	10.0
16	1,1,2,2–Tetrachloroethane	4.3	ug/L	1.0	1.0	6.1	1.0	1.0
16	1,1,2–Trichloroethane	0.6	ug/L	0.2	0.2	1.7	0.2	0.2
16	1,1–Dichloroethane	0.8	ug/L	0.2	0.2	1.2	0.2	0.2
16	1,2–Dichloroethane	0.8	ug/L	0.2	0.2	1.2	0.2	0.2
16	1,2–Dichloropropane	0.9	ug/L	0.2	0.2	1.2	0.2	0.2
16	Bromodichloromethane	0.8	ug/L	4.7	2.1	1.8	2.5	2.8
16	Bromoform	3.7	ug/L	2.0	2.0	12.2	2.0	2.0
16	Bromomethane	3.7	ug/L	2.0	2.0	12.2	2.0	2.0
16	Chlorobenzene	0.7	ug/L	0.2	0.2	1.2	0.2	0.2
16	Chloroform	0.7	ug/L	7.6	4.0	4.3	4.7	5.2
16	Chloromethane	3.7	ug/L	2.0	2.0	12.2	2.0	2.0
16	Cis–1,3–Dichloropropylene	1.4	ug/L	0.5	0.5	3.0	0.5	0.5
16	Dibromochloromethane	1.1	ug/L	2.4	1.1	6.2	1.3	1.4
16	Ethylene dibromide	1.0	ug/L	1.0	1.0	6.1	1.0	1.0
16	Methylene chloride	1.3	ug/L	0.6	0.5	4.1	0.6	0.7
16	Tetrachloroethylene	1.1	ug/L	0.5	0.5	3.0	0.5	0.5
16	Trans–1,3–Dichloropropylene	1.4	ug/L	0.5	0.5	3.0	0.5	0.5
16	Trichlorofluoromethane	1.0	ug/L	1.0	1.0	6.1	1.5	1.1
16	Vinyl chloride	4.0	ug/L	2.0	2.0	12.2	2.0	2.0

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – KINGSTON

ATG	PARAMETER	RMDL	UNIT	IN 1300	PR 0600	PR 1000	CO 0700	CO 1100
17	Benzene	0.5	ug/L	0.1	0.3	2.2	0.4	0.7
17	Ethylbenzene	0.6	ug/L	0.2	0.2	1.2	0.2	0.2
17	Styrene	0.5	ug/L	0.2	0.2	1.2	0.3	0.5
17	Toluene	0.5	ug/L	0.2	0.2	1.3	0.2	0.3
17	o–Xylene	0.5	ug/L	0.2	0.2	1.2	0.2	0.2
18	Acrolein	4.0	ug/L	4.0	4.0	24.3	4.0	4.0
18	Acrylonitrile	4.2	ug/L	2.0	2.0	12.2	2.0	2.0
19	Biphenyl	0.6	ug/L	–	4.6	2.3	2.6	2.2
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	–	2.0	13.7	2.0	2.4
19	Diphenyl ether	0.4	ug/L	–	14.6	4.3	7.2	7.2
24	2,3,7,8 TCDD	20.0	pg/L	–	20.0	23.8	20.0	20.0
24	Total TCDD	20.0	pg/L	–	20.0	154.0	20.0	20.0
24	Total H7CDD	30.0	pg/L	–	21.0	30.3	25.8	21.0
24	Total H7CDF	30.0	pg/L	–	23.0	28.0	23.0	23.0
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	–	30.0	69.3	30.0	30.0
24	Octachlorodibenzofuran	30.0	pg/L	–	30.0	51.0	30.0	30.0
25	Oil and grease	1.0	mg/L	1.3	1.4	250.3	1.7	1.7
98	Ftflow		m3/day	63856	892	114	29072	24770

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 1300 – Intake Water to Site
PR 0600 – Flake Effluent flows into CO 1100
PR 1000 – Staple Sewer flows into CO 1100
CO 0700 – Service Sewer to Lake
CO 1100 – Catch Tank Effluent to Lake

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – KINGSTON

ATG	PARAMETER	IN 1300	PR 0600	PR 1000	CO 0700	CO 1100	TOTAL
1	COD	–	16.427	121.988	805.183	847.071	1652.254
2	Cyanide Total	–	0.005	*	0.132	0.122	0.254
4	Ammonia plus Ammonium	–	0.232	0.037	3.908	24.779	28.687
4	Nitrate+Nitrite	–	0.243	0.010	7.054	6.837	13.891
4	Total Kjeldahl Nitrogen	–	1.006	0.637	46.894	28.647	75.541
5	DOC	99.788	4.445	19.828	117.409	159.451	276.860
5	TOC	91.267	6.249	25.228	226.423	108.298	334.721
6	Total phosphorus	5.420	0.140	0.312	3.681	7.616	11.297
8	Total suspended solids	491.162	9.572	7.911	162.726	202.866	365.592
8	Volatile suspended solids	–	4.916	12.129	131.655	99.357	231.012
9	Aluminum	3.596	0.039	0.004	1.251	1.091	2.342
9	Boron	2.852	0.048	0.011	1.592	1.335	2.927
9	Copper	4.612	0.018	0.002	0.322	0.368	0.690
9	Zinc	5.184	0.010	0.004	0.290	0.952	1.242
12	Mercury	–	*	*	0.003	0.003	0.006
14	Phenolics (4AAP)	0.064	0.001	0.020	0.037	0.048	0.085
15	Sulphide	0.542	0.009	0.005	0.290	0.252	0.542
16	1,1,2,2-Tetrachloroethane	0.054	0.001	0.001	0.029	0.025	0.054
16	1,1,2-Trichloroethane	0.014	*	*	0.007	0.005	0.012
16	1,1-Dichloroethane	0.011	*	*	0.006	0.005	0.011
16	1,2-Dichloroethane	0.011	*	*	0.006	0.005	0.011
16	1,2-Dichloropropane	0.011	*	*	0.006	0.005	0.011
16	Bromodichloromethane	0.274	0.002	*	0.074	0.064	0.138
16	Bromoform	0.108	0.002	0.001	0.058	0.050	0.108
16	Bromomethane	0.108	0.002	0.001	0.058	0.050	0.108
16	Chlorobenzene	0.011	*	*	0.006	0.005	0.011
16	Chloroform	0.422	0.003	*	0.119	0.119	0.238
16	Chloromethane	0.108	0.002	0.001	0.058	0.050	0.108
16	Cis-1,3-Dichloropropylene	0.027	*	*	0.015	0.013	0.028
16	Dibromochloromethane	0.160	0.001	0.001	0.044	0.036	0.080
16	Ethylene dibromide	0.054	0.001	0.001	0.029	0.025	0.054
16	Methylene chloride	0.034	*	*	0.016	0.018	0.034
16	Tetrachloroethylene	0.027	*	*	0.015	0.013	0.028
16	Trans-1,3-Dichloropropylene	0.027	*	*	0.015	0.013	0.028
16	Trichlorofluoromethane	0.054	0.001	0.001	0.029	0.026	0.055
16	Vinyl chloride	0.108	0.002	0.001	0.058	0.050	0.108

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – KINGSTON

ATG	PARAMETER	IN 1300	PR 0600	PR 1000	CO 0700	CO 1100	TOTAL
17	Benzene	0.005	*	*	0.011	0.006	0.017
17	Ethylbenzene	0.011	*	*	0.006	0.005	0.011
17	Styrene	0.011	*	*	0.010	0.012	0.022
17	Toluene	0.011	*	*	0.006	0.008	0.014
17	o–Xylene	0.011	*	*	0.006	0.005	0.011
18	Acrolein	0.217	0.004	0.003	0.116	0.101	0.217
18	Acrylonitrile	0.108	0.002	0.001	0.058	0.050	0.108
19	Biphenyl	–	0.005	*	0.080	0.066	0.146
19	Bis(2–ethylhexyl) phthalate	–	0.002	0.001	0.052	0.064	0.116
19	Diphenyl ether	–	0.015	*	0.232	0.212	0.444
24	2,3,7,8 TCDD	–	*	*	*	*	*
24	Total TCDD	–	*	*	*	*	*
24	Total H7CDD	–	*	*	*	*	*
24	Total H7CDF	–	*	*	*	*	*
24	Octachlorodibenzo–p–dioxin	–	*	*	*	*	*
24	Octachlorodibenzofuran	–	*	*	*	*	*
25	Oil and grease	65.257	1.294	29.987	49.384	41.681	91.065

EXPLANATORY NOTES:
(i) "–" not required by the regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 1300 – Intake Water to Site
PR 0600 – Flake Effluent flows into CO 1100
PR 1000 – Staple Sewer flows into CO 1100
CO 0700 – Service Sewer to Lake
CO 1100 – Catch Tank Effluent to Lake

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
DU PONT CANADA - KINGSTON

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - KINGSTON

CONTROL POINT - PR 0600 Flake Effluent flows into CO 1100
AVERAGE FLOWRATE = 892 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	16.75	16.427	16.75	16.427	16.75	16.427	16.75	16.427	DupK	DupK	DupK
2	Cyanide Total	0.005	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	DupK	DupK	DupK
4	Ammonia plus Ammonium	0.25	mg/L	0.21	0.232	0.21	0.232	0.21	0.232	0.21	0.232	DupK	DupK	DupK
4	Nitrate+Nitrite	0.25	mg/L	0.25	0.243	0.25	0.243	0.25	0.243	0.25	0.243	DupK	DupK	DupK
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.1	1.006	1.1	1.006	1.1	1.006	1.1	1.006	DupK	DupK	DupK
5	DOC	0.5	mg/L	5.0	4.445	5.0	4.445	5.0	4.445	4.4	3.925	DupK	DupK	Esso
5	TOC	5	mg/L	7	6.249	7	6.249	7	6.249	5	4.460	DupK	DupK	Esso
6	Total phosphorus	0.10	mg/L	0.22	0.140	0.22	0.140	0.22	0.140	0.22	0.140	DupK	DupK	DupK
8	Total suspended solids	5	mg/L	11	9.572	11	9.572	11	9.572	11	9.572	DupK	DupK	DupK
8	Volatile suspended solids	10	mg/L	5	4.916	5	4.916	5	4.916	5	4.916	DupK	DupK	DupK
9	Aluminum	30.0	ug/L	44.8	0.039	44.8	0.039	44.8	0.039	44.8	0.039	DupK	DupK	DupK
9	Boron	50.0	ug/L	53.3	0.048	53.3	0.048	53.3	0.048	53.3	0.048	DupK	DupK	DupK
9	Copper	10.0	ug/L	22.5	0.018	22.5	0.018	22.5	0.018	22.5	0.018	DupK	DupK	DupK
9	Zinc	10.0	ug/L	12.5	0.010	12.5	0.010	12.5	0.010	12.5	0.010	DupK	DupK	DupK
12	Mercury	0.10	ug/L	0.17	*	0.17	*	0.17	*	0.17	*	DupK	DupK	DupK
14	Phenolics (4AAP)	2.0	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	DupK	DupK	DupK
15	Sulphide	20.0	ug/L	10.0	0.009	10.0	0.009	10.0	0.009	10.0	0.009	DupK	DupK	DupK
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	DupK	DupK	DupK
16	1,1,2-Trichloroethane	0.6	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
16	1,1-Dichloroethane	0.8	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
16	1,2-Dichloroethane	0.8	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
16	1,2-Dichloropropane	0.9	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
16	Bromodichloromethane	0.8	ug/L	2.1	0.002	2.1	0.002	2.1	0.002	2.1	0.002	DupK	DupK	DupK
16	Bromoform	3.7	ug/L	2.0	0.002	2.0	0.002	2.0	0.002	2.0	0.002	DupK	DupK	DupK
16	Bromomethane	3.7	ug/L	2.0	0.002	2.0	0.002	2.0	0.002	2.0	0.002	DupK	DupK	DupK
16	Chlorobenzene	0.7	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
16	Chloroform	0.7	ug/L	4.0	0.003	4.0	0.003	4.0	0.003	4.0	0.003	DupK	DupK	DupK
16	Chloromethane	3.7	ug/L	2.0	0.002	2.0	0.002	2.0	0.002	2.0	0.002	DupK	DupK	DupK
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DupK	DupK	DupK
16	Dibromochloromethane	1.1	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	DupK	DupK	DupK
16	Ethylene dibromide	1.0	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	DupK	DupK	DupK
16	Methylene chloride	1.3	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DupK	DupK	DupK
16	Tetrachloroethylene	1.1	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DupK	DupK	DupK
16	Trans-1,3-Dichloropropylene	1.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DupK	DupK	DupK
16	Trichlorofluoromethane	1.0	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	DupK	DupK	DupK
16	Vinyl chloride	4.0	ug/L	2.0	0.002	2.0	0.002	2.0	0.002	2.0	0.002	DupK	DupK	DupK
17	Benzene	0.5	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	DupK	DupK	DupK
17	Ethylbenzene	0.6	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
17	Styrene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
17	Toluene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
17	o-Xylene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	DupK	DupK	DupK
18	Acrolein	4.0	ug/L	4.0	0.004	4.0	0.004	4.0	0.004	4.0	0.004	DupK	DupK	DupK
18	Acrylonitrile	4.2	ug/L	2.0	0.002	2.0	0.002	2.0	0.002	2.0	0.002	DupK	DupK	DupK
19	Biphenyl	0.6	ug/L	4.6	0.005	4.6	0.005	4.6	0.005	4.6	0.005	DupK	DupK	DupK
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.0	0.002	2.0	0.002	2.0	0.002	2.0	0.002	DupK	DupK	DupK
19	Diphenyl ether	0.4	ug/L	14.6	0.015	14.6	0.015	14.6	0.015	10.0	0.009	DupK	DupK	RREL
24	2,3,7,8 TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupK	DupK	DupK
24	Total TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupK	DupK	DupK
24	Total H7CDD	30.0	pg/L	21.0	*	21.0	*	21.0	*	21.0	*	DupK	DupK	DupK
24	Total H7CDF	30.0	pg/L	23.0	*	23.0	*	23.0	*	23.0	*	DupK	DupK	DupK
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupK	DupK	DupK
24	Octachlorodibenzofuran	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupK	DupK	DupK
25	Oil and grease	1.0	mg/L	1.4	1.294	1.4	1.294	1.4	1.294	1.4	1.294	DupK	DupK	DupK

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - KINGSTON

CONTROL POINT - PR 1000 Staple Sewer flows into CO 1100
AVERAGE FLOWRATE = 114 M3/DAY

						BAT OPTION 1		BAT OPTION 2		BAT OPTION 3				
				12 MONTH AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	1180	121.988	1180	121.988	69	7.866	31	3.534	DupK	Polysar	Esso
2	Cyanide Total	0.005	mg/L	0.005	*	0.005	*	0.005	*	0.005	*	DupK	DupK	DupK
4	Ammonia plus Ammonium	0.25	mg/L	0.36	0.037	0.36	0.037	0.36	0.037	0.36	0.037	DupK	DupK	DupK
4	Nitrate+Nitrite	0.25	mg/L	0.09	0.010	0.09	0.010	0.09	0.010	0.09	0.010	DupK	DupK	DupK
4	Total Kjeldahl Nitrogen	0.5	mg/L	5.5	0.637	5.5	0.637	2.3	0.262	2.3	0.262	DupK	Polysar	Polysar
5	DOC	0.5	mg/L	159.3	19.828	159.3	19.828	16.7	1.904	4.4	0.502	DupK	Polysar	Esso
5	TOC	5	mg/L	204	25.228	204	25.228	15	1.710	5	0.570	DupK	Polysar	Esso
6	Total phosphorus	0.10	mg/L	2.90	0.312	2.90	0.312	0.71	0.081	0.71	0.081	DupK	Polysar	Polysar
8	Total suspended solids	5	mg/L	68	7.911	68	7.911	15	1.710	5	0.570	DupK	Polysar	P1774
8	Volatile suspended solids	10	mg/L	120	12.129	120	12.129	8	0.912	5	0.570	DupK	Polysar	P1774
9	Aluminum	30.0	ug/L	39.4	0.004	39.4	0.004	39.4	0.004	39.4	0.004	DupK	DupK	DupK
9	Boron	50.0	ug/L	93.3	0.011	93.3	0.011	93.3	0.011	93.3	0.011	DupK	DupK	DupK
9	Copper	10.0	ug/L	19.2	0.002	19.2	0.002	19.2	0.002	19.2	0.002	DupK	DupK	DupK
9	Zinc	10.0	ug/L	35.2	0.004	35.2	0.004	35.2	0.004	35.2	0.004	DupK	DupK	DupK
12	Mercury	0.10	ug/L	0.11	*	0.11	*	0.11	*	0.11	*	DupK	DupK	DupK
14	Phenolics (4AAP)	2.0	ug/L	233.9	0.020	233.9	0.020	10.1	0.001	2.5	*	DupK	Polysar	Esso
15	Sulphide	20.0	ug/L	57.3	0.005	57.3	0.005	57.3	0.005	57.3	0.005	DupK	DupK	DupK
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	6.1	0.001	6.1	0.001	6.1	0.001	6.1	0.001	DupK	DupK	DupK
16	1,1,2-Trichloroethane	0.6	ug/L	1.7	*	1.7	*	1.7	*	1.7	*	DupK	DupK	DupK
16	1,1-Dichloroethane	0.8	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK
16	1,2-Dichloroethane	0.8	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK
16	1,2-Dichloropropane	0.9	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK
16	Bromodichloromethane	0.8	ug/L	1.8	*	1.8	*	1.8	*	0.4	*	DupK	DupK	Esso
16	Bromoform	3.7	ug/L	12.2	0.001	12.2	0.001	12.2	0.001	12.2	0.001	DupK	DupK	DupK
16	Bromomethane	3.7	ug/L	12.2	0.001	12.2	0.001	12.2	0.001	12.2	0.001	DupK	DupK	DupK
16	Chlorobenzene	0.7	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK
16	Chloroform	0.7	ug/L	4.3	*	4.3	*	4.3	*	1.2	*	DupK	DupK	Esso
16	Chloromethane	3.7	ug/L	12.2	0.001	12.2	0.001	12.2	0.001	5.0	0.001	DupK	DupK	RREL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	3.0	*	3.0	*	3.0	*	3.0	*	DupK	DupK	DupK
16	Dibromochloromethane	1.1	ug/L	6.2	0.001	6.2	0.001	6.2	0.001	6.2	0.001	DupK	DupK	DupK
16	Ethylene dibromide	1.0	ug/L	6.1	0.001	6.1	0.001	6.1	0.001	6.1	0.001	DupK	DupK	DupK
16	Methylene chloride	1.3	ug/L	4.1	*	4.1	*	4.1	*	4.1	*	DupK	DupK	DupK
16	Tetrachloroethylene	1.1	ug/L	3.0	*	3.0	*	3.0	*	2.1	*	DupK	DupK	Esso
16	Trans-1,3-Dichloropropylene	1.4	ug/L	3.0	*	3.0	*	3.0	*	3.0	*	DupK	DupK	DupK
16	Trichlorofluoromethane	1.0	ug/L	6.1	0.001	6.1	0.001	6.1	0.001	6.1	0.001	DupK	DupK	DupK
16	Vinyl chloride	4.0	ug/L	12.2	0.001	12.2	0.001	12.2	0.001	2.6	0.001	DupK	DupK	Esso
17	Benzene	0.5	ug/L	2.2	*	2.2	*	2.2	*	2.2	*	DupK	DupK	DupK
17	Ethylbenzene	0.6	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - KINGSTON

CONTROL POINT - PR 1000 Staple Sewer flows into CO 1100
AVERAGE FLOWRATE = 114 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVLRAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
17	Styrene	0.5	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK
17	Toluene	0.5	ug/L	1.3	*	1.3	*	1.3	*	1.3	*	DupK	DupK	DupK
17	o-Xylene	0.5	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupK	DupK	DupK
18	Acrolein	4.0	ug/L	24.3	0.003	24.3	0.003	4.2	*	4.2	*	DupK	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	12.2	0.001	12.2	0.001	2.8	*	2.8	*	DupK	Polysar	Polysar
19	Biphenyl	0.6	ug/L	2.3	*	2.3	*	2.3	*	2.3	*	DupK	DupK	DupK
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	13.7	0.001	13.7	0.001	7.2	0.001	7.2	0.001	DupK	Polysar	Polysar
19	Diphenyl ether	0.4	ug/L	4.3	*	4.3	*	4.3	*	4.3	*	DupK	DupK	DupK
24	2,3,7,8 TCDD	20.0	pg/L	23.8	*	23.8	*	23.8	*	23.8	*	DupK	DupK	DupK
24	Total TCDD	20.0	pg/L	154.0	*	154.0	*	154.0	*	154.0	*	DupK	DupK	DupK
24	Total H7CDD	30.0	pg/L	30.3	*	30.3	*	30.3	*	30.3	*	DupK	DupK	DupK
24	Total H7CDF	30.0	pg/L	28.0	*	28.0	*	28.0	*	28.0	*	DupK	DupK	DupK
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	69.3	*	69.3	*	69.3	*	69.3	*	DupK	DupK	DupK
24	Octachlorodibenzofuran	30.0	pg/L	51.0	*	51.0	*	51.0	*	51.0	*	DupK	DupK	DupK
25	Oil and grease	1.0	mg/L	250.3	29.987	250.3	29.987	3.8	0.433	3.8	0.433	DupK	Polysar	Polysar

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - KINGSTON

CONTROL POINT - CO 0700 Service Sewer to Lake
AVERAGE FLOWRATE = 29072 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	25.75	805.183	25.75	805.183	25.75	805.183	25.75	805.183	DupK	DupK	DupK
2	Cyanide Total	0.005	mg/L	0.005	0.132	0.005	0.132	0.005	0.132	0.005	0.132	DupK	DupK	DupK
4	Ammonia plus Ammonium	0.25	mg/L	0.15	3.908	0.15	3.908	0.15	3.908	0.15	3.908	DupK	DupK	DupK
4	Nitrate+Nitrite	0.25	mg/L	0.26	7.054	0.26	7.054	0.26	7.054	0.26	7.054	DupK	DupK	DupK
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.5	46.894	1.5	46.894	1.5	46.894	1.5	46.894	DupK	DupK	DupK
5	DOC	0.5	mg/L	4.2	117.409	4.2	117.409	4.2	117.409	4.2	117.409	DupK	DupK	DupK
5	TOC	5	mg/L	6	226.423	6	226.423	6	226.423	6	226.423	DupK	DupK	DupK
6	Total phosphorus	0.10	mg/L	0.12	3.681	0.12	3.681	0.12	3.681	0.12	3.681	DupK	DupK	DupK
8	Total suspended solids	5	mg/L	5	162.726	5	162.726	5	162.726	5	162.726	DupK	DupK	DupK
8	Volatile suspended solids	10	mg/L	5	131.655	5	131.655	5	131.655	5	131.655	DupK	DupK	DupK
9	Aluminum	30.0	ug/L	39.0	1.251	39.0	1.251	39.0	1.251	39.0	1.251	DupK	DupK	DupK
9	Boron	50.0	ug/L	56.7	1.592	56.7	1.592	56.7	1.592	56.7	1.592	DupK	DupK	DupK
9	Copper	10.0	ug/L	10.8	0.322	10.8	0.322	10.8	0.322	10.8	0.322	DupK	DupK	DupK
9	Zinc	10.0	ug/L	10.0	0.290	10.0	0.290	10.0	0.290	10.0	0.290	DupK	DupK	DupK
12	Mercury	0.10	ug/L	0.10	0.003	0.10	0.003	0.10	0.003	0.10	0.003	DupK	DupK	DupK
14	Phenolics (4AAP)	2.0	ug/L	1.3	0.037	1.3	0.037	1.3	0.037	1.3	0.037	DupK	DupK	DupK
15	Sulphide	20.0	ug/L	10.0	0.290	10.0	0.290	10.0	0.290	10.0	0.290	DupK	DupK	DupK
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	1.0	0.029	1.0	0.029	1.0	0.029	1.0	0.029	DupK	DupK	DupK
16	1,1,2-Trichloroethane	0.6	ug/L	0.2	0.007	0.2	0.007	0.2	0.007	0.2	0.007	DupK	DupK	DupK
16	1,1-Dichloroethane	0.8	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
16	1,2-Dichloroethane	0.8	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
16	1,2-Dichloropropane	0.9	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
16	Bromodichloromethane	0.8	ug/L	2.5	0.074	2.5	0.074	2.5	0.074	2.5	0.074	DupK	DupK	DupK
16	Bromoform	3.7	ug/L	2.0	0.058	2.0	0.058	2.0	0.058	2.0	0.058	DupK	DupK	DupK
16	Bromomethane	3.7	ug/L	2.0	0.058	2.0	0.058	2.0	0.058	2.0	0.058	DupK	DupK	DupK
16	Chlorobenzene	0.7	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
16	Chloroform	0.7	ug/L	4.7	0.119	4.7	0.119	4.7	0.119	4.7	0.119	DupK	DupK	DupK
16	Chloromethane	3.7	ug/L	2.0	0.058	2.0	0.058	2.0	0.058	2.0	0.058	DupK	DupK	DupK
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.015	0.5	0.015	0.5	0.015	0.5	0.015	DupK	DupK	DupK
16	Dibromochloromethane	1.1	ug/L	1.3	0.044	1.3	0.044	1.3	0.044	1.3	0.044	DupK	DupK	DupK
16	Ethylene dibromide	1.0	ug/L	1.0	0.029	1.0	0.029	1.0	0.029	1.0	0.029	DupK	DupK	DupK
16	Methylene chloride	1.3	ug/L	0.6	0.016	0.6	0.016	0.6	0.016	0.6	0.016	DupK	DupK	DupK
16	Tetrachloroethylene	1.1	ug/L	0.5	0.015	0.5	0.015	0.5	0.015	0.5	0.015	DupK	DupK	DupK
16	Trans-1,3-Dichloropropylene	1.4	ug/L	0.5	0.015	0.5	0.015	0.5	0.015	0.5	0.015	DupK	DupK	DupK
16	Trichlorofluoromethane	1.0	ug/L	1.5	0.029	1.5	0.029	1.5	0.029	1.5	0.029	DupK	DupK	DupK
16	Vinyl chloride	4.0	ug/L	2.0	0.058	2.0	0.058	2.0	0.058	2.0	0.058	DupK	DupK	DupK
17	Benzene	0.5	ug/L	0.4	0.011	0.4	0.011	0.4	0.011	0.4	0.011	DupK	DupK	DupK
17	Ethylbenzene	0.6	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
17	Styrene	0.5	ug/L	0.3	0.010	0.3	0.010	0.3	0.010	0.3	0.010	DupK	DupK	DupK
17	Toluene	0.5	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
17	o-Xylene	0.5	ug/L	0.2	0.006	0.2	0.006	0.2	0.006	0.2	0.006	DupK	DupK	DupK
18	Acrolein	4.0	ug/L	4.0	0.116	4.0	0.116	4.0	0.116	4.0	0.116	DupK	DupK	DupK
18	Acrylonitrile	4.2	ug/L	2.0	0.058	2.0	0.058	2.0	0.058	2.0	0.058	DupK	DupK	DupK
19	Biphenyl	0.6	ug/L	2.6	0.080	2.6	0.080	2.6	0.080	2.6	0.080	DupK	DupK	DupK
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.0	0.052	2.0	0.052	2.0	0.052	2.0	0.052	DupK	DupK	DupK
19	Diphenyl ether	0.4	ug/L	7.2	0.232	7.2	0.232	7.2	0.232	7.2	0.232	DupK	DupK	DupK
24	2,3,7,8 TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupK	DupK	DupK
24	Total TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupK	DupK	DupK
24	Total H7CDD	30.0	pg/L	25.8	*	25.8	*	25.8	*	25.8	*	DupK	DupK	DupK
24	Total H7CDF	30.0	pg/L	23.0	*	23.0	*	23.0	*	23.0	*	DupK	DupK	DupK
24	Octachlorodibenzo-p dioxin	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupK	DupK	DupK
24	Octachlorodibenzofuran	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupK	DupK	DupK
25	Oil and grease	1.0	mg/L	1.7	49.384	1.7	49.384	1.7	49.384	1.7	49.384	DupK	DupK	DupK

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - KINGSTON

CONTROL POINT - CO 1100 Catch Tank Effluent to Lake
AVERAGE FLOWRATE = 24770 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	31	847.071	31	847.071	31	847.071	31	847.071	DupK	DupK	DupK
2	Cyanide Total	0.005	mg/L	0.005	0.122	0.005	0.122	0.005	0.122	0.005	0.122	DupK	DupK	DupK
4	Ammonia plus Ammonium	0.25	mg/L	0.77	24.779	0.77	24.779	0.77	24.779	0.77	24.779	DupK	DupK	DupK
4	Nitrate+Nitrite	0.25	mg/L	0.29	6.837	0.29	6.837	0.29	6.837	0.29	6.837	DupK	DupK	DupK
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.1	28.647	1.1	28.647	1.1	28.647	1.1	28.647	DupK	DupK	DupK
5	DOC	0.5	mg/L	6.7	159.451	6.7	159.451	6.7	159.451	6.7	159.451	DupK	DupK	DupK
5	TOC	5	mg/L	4	108.298	4	108.298	4	108.298	4	108.298	DupK	DupK	DupK
6	Total phosphorus	0.10	mg/L	0.27	7.616	0.27	7.616	0.27	7.616	0.27	7.616	DupK	DupK	DupK
8	Total suspended solids	5	mg/L	8	202.866	8	202.866	8	202.866	8	202.866	DupK	DupK	DupK
8	Volatile suspended solids	10	mg/L	4	99.357	4	99.357	4	99.357	4	99.357	DupK	DupK	DupK
9	Aluminum	30.0	ug/L	42.8	1.091	42.8	1.091	42.8	1.091	42.8	1.091	DupK	DupK	DupK
9	Boron	50.0	ug/L	63.3	1.335	63.3	1.335	63.3	1.335	63.3	1.335	DupK	DupK	DupK
9	Copper	10.0	ug/L	16.7	0.368	16.7	0.368	16.7	0.368	16.7	0.368	DupK	DupK	DupK
9	Zinc	10.0	ug/L	27.5	0.952	27.5	0.952	27.5	0.952	27.5	0.952	DupK	DupK	DupK
12	Mercury	0.10	ug/L	0.10	0.003	0.10	0.003	0.10	0.003	0.10	0.003	DupK	DupK	DupK
14	Phenolics (4AAP)	2.0	ug/L	1.7	0.048	1.7	0.048	1.7	0.048	1.7	0.048	DupK	DupK	DupK
15	Sulphide	20.0	ug/L	10.0	0.252	10.0	0.252	10.0	0.252	10.0	0.252	DupK	DupK	DupK
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	1.0	0.025	1.0	0.025	1.0	0.025	1.0	0.025	DupK	DupK	DupK
16	1,1,2-Trichloroethane	0.6	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
16	1,1-Dichloroethane	0.8	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
16	1,2-Dichloroethane	0.8	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
16	1,2-Dichloropropane	0.9	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
16	Bromodichloromethane	0.8	ug/L	2.8	0.064	2.8	0.064	2.8	0.064	2.8	0.064	DupK	DupK	DupK
16	Bromoform	3.7	ug/L	2.0	0.050	2.0	0.050	2.0	0.050	2.0	0.050	DupK	DupK	DupK
16	Bromomethane	3.7	ug/L	2.0	0.050	2.0	0.050	2.0	0.050	2.0	0.050	DupK	DupK	DupK
16	Chlorobenzene	0.7	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
16	Chloroform	0.7	ug/L	5.2	0.119	5.2	0.119	5.2	0.119	5.2	0.119	DupK	DupK	DupK
16	Chloromethane	3.7	ug/L	2.0	0.050	2.0	0.050	2.0	0.050	2.0	0.050	DupK	DupK	DupK
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.5	0.013	0.5	0.013	0.5	0.013	0.5	0.013	DupK	DupK	DupK
16	Dibromochloromethane	1.1	ug/L	1.4	0.036	1.4	0.036	1.4	0.036	1.4	0.036	DupK	DupK	DupK
16	Ethylene dibromide	1.0	ug/L	1.0	0.025	1.0	0.025	1.0	0.025	1.0	0.025	DupK	DupK	DupK
16	Methylene chloride	1.3	ug/L	0.7	0.018	0.7	0.018	0.7	0.018	0.7	0.018	DupK	DupK	DupK
16	Tetrachloroethylene	1.1	ug/L	0.5	0.013	0.5	0.013	0.5	0.013	0.5	0.013	DupK	DupK	DupK
16	Trans-1,3-Dichloropropylene	1.4	ug/L	0.5	0.013	0.5	0.013	0.5	0.013	0.5	0.013	DupK	DupK	DupK
16	Trichlorofluoromethane	1.0	ug/L	1.1	0.026	1.1	0.026	1.1	0.026	1.1	0.026	DupK	DupK	DupK
16	Vinyl chloride	4.0	ug/L	2.0	0.050	2.0	0.050	2.0	0.050	2.0	0.050	DupK	DupK	DupK
17	Benzene	0.5	ug/L	0.7	0.006	0.7	0.006	0.7	0.006	0.7	0.006	DupK	DupK	DupK
17	Ethylbenzene	0.[illegible]	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
17	Styrene	0.5	ug/L	0.5	0.012	0.5	0.012	0.5	0.012	0.5	0.012	DupK	DupK	DupK
17	Toluene	0.5	ug/L	0.3	0.008	0.3	0.008	0.3	0.008	0.3	0.008	DupK	DupK	DupK
17	o-Xylene	0.5	ug/L	0.2	0.005	0.2	0.005	0.2	0.005	0.2	0.005	DupK	DupK	DupK
18	Acrolein	4.0	ug/L	4.0	0.101	4.0	0.101	4.0	0.101	4.0	0.101	DupK	DupK	DupK
18	Acrylonitrile	4.2	ug/L	2.0	0.050	2.0	0.050	2.0	0.050	2.0	0.050	DupK	DupK	DupK
19	Biphenyl	0.[illegible]	ug/L	2.2	0.066	2.2	0.066	2.2	0.066	2.2	0.066	DupK	DupK	DupK
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.4	0.064	2.4	0.064	2.4	0.064	2.4	0.064	DupK	DupK	DupK
19	Diphenyl ether	0.4	ug/L	7.2	0.212	7.2	0.212	7.2	0.212	7.2	0.212	DupK	DupK	DupK
24	2,3,7,8 TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupK	DupK	DupK
24	Total TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupK	DupK	DupK
24	Total H7CDD	30.0	pg/L	21.0	*	21.0	*	21.0	*	21.0	*	DupK	DupK	DupK
24	Total H7CDF	30.0	pg/L	23.0	*	23.0	*	23.0	*	23.0	*	DupK	DupK	DupK
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupK	DupK	DupK
24	Octachlorodibenzofuran	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupK	DupK	DupK
25	Oil and grease	1.0	mg/L	1.7	41.681	1.7	41.681	1.7	41.681	1.7	41.681	DupK	DupK	DupK

* - Less than 1 gram per day

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

DU PONT CANADA INC. - MAITLAND SITE

1.0 PLANT DESCRIPTION

The Du Pont Canada Maitland Site is located along the St. Lawrence River about 100 km east of Kingston. In 1953, the site began production of adipic acid and hexamethylene diamine for polymerization into nylon 66 at the Du Pont Kingston plant. Today these two raw materials continue to be the major products at the site although the site has diversified into additional product areas.

The site currently manufactures chlorofluorocarbons, spandex fibres, engineering polymers, dibasic acids, hydrochloric acid and hydrogen peroxide. Tetraethyl lead, a gasoline antiknock compound was produced at the site for over 20 years but was phased out in 1985.

Chlorofluorocarbons are used in refrigeration systems, as solvents in the computer industry and as blowing agents in making expanded cellular plastics such as egg cartons, meat trays and protective shipping materials. Spandex elastic yarns find applications in leotards, pantyhose and hockey uniforms. Nylon resin is compounded with elastomers to produce a tough engineering polymer for welder's helmets, bicycle wheels and skate guards.

A world scale, state-of-the-art, hydrogen peroxide plant was started up in 1987 with the purpose of supplying the pulp and paper industry with a bleaching agent.

Process effluents are directed to an extended aeration biological treatment plant with nitrification and denitrification. Typically 95% of the carbonaceous and 80% to 95% of the nitrogenous wastes are removed by biological treatment. The treatment plant effluent (MISA Control Point PR 0300) is combined with spent once-through cooling water in two of three detention ponds.

Spent once-through cooling water is discharged via a cribbed ditch to three detention ponds. The effluent from the ponds is discharged to the St. Lawrence River through MISA Control Point CO 1100.

Some process materials from barometric condensers, scrubbers, seal pots and building floor drains also end up in the cribbed ditch with spent once through cooling water.

The site makes use of on-line spill and pH monitors on key streams to ensure early detection of any process spills. A second level of protection against spills impacting the river is provided by the three detention ponds with their oil skimmers and ability to isolate the pond contents.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Depending on the nature of the wastewater and the degree of contamination, segregated sewers are used to separate process and cooling water flows. Most streams discharge to either the cribbed ditch which in turn flows into the detention ponds or to the on-site Wastewater Treatment Plant (WTP). Cooling water is generally conveyed to the cribbed ditch while process water is directed to the process sewer. The cribbed ditch water is directed to the three detention ponds, while flows to the process sewer discharge to the WTP. For the most part, stormwater runoff drains from paved areas and roofs to ditches leading to the cribbed ditch. Both the cribbed ditch and the effluent from the WTP are discharged to the three detention ponds before being discharged through a single outfall (MISA Control Point CO 1100). Table 1.0 presents the wastewater sources at the site and their destination.

There are five MISA monitoring points at the site. Table 2.0 presents the sources of wastewater at each of the MISA monitoring points.

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 0300, CO 0400, CO 0500, CO 0700, and CO 1100.

TABLE 1.0
SOURCES OF WASTEWATER AT DU PONT CANADA INC. - MAITLAND SITE

Source	Type	Destination
Nylon Intermediates Cyclohexane Oxidation		
Oxidation Reactor Condensers Distillation Columns	Once-through cooling water	Cribbed Ditch
Oil Separator	Process Water	Wastewater Treatment Plant

TABLE 1.0 SOURCES OF WASTEWATER AT DU PONT CANADA INC. - MAITLAND SITE		
Source	**Type**	**Destination**
Distillation Columns	Non-Volatile Residue	Boilers
Distillation Columns	Seal Water	Cribbed Ditch
Floor Drains	Wash/Spill Water	Waste Oil Separator to Wastewater Treatment Plant
Pump Pads	Spills	Waste Oil Separator to Wastewater Treatment Plant
Column Wash	Washwater	Detention Ponds
Cyclohexane Tanks	Spills	Sump/Recovery
Cyclohexane Offload Area	Spills	Sump/Recovery
Nylon Intermediates Adipic Acid		
Oxidation Reactor	Once-through cooling water	Cribbed Ditch
Caustic Scrubber	Scrubber Water	Wastewater Treatment Plant
Steam Distillation	Once-through cooling water	Cribbed Ditch
Steam Distillation	Distillate	Wastewater Treatment Plant
Jet/Trench/Dyke	Once-through cooling water	Cribbed Ditch
DBA Distiller	Distillate	Wastewater Treatment Plant
DBA Distiller	DBE Tails	Boiler or Sales
Refining Condenser/Jet	Once-through cooling water	Cribbed Ditch
Coolers and Seal Tanks	Cooling/Squelch Water	Cribbed Ditch
Crystallizers	Process Water	Wastewater Treatment Plant
DBE Distillation	Distiller Bottoms	Wastewater Treatment Plant
Methanol Recovery	Distiller Bottoms	Wastewater Treatment Plant
Methanol Recovery	Vent Scrubber Water	Wastewater Treatment Plant
Mother Liquor Purification Purge	Column Tails	Wastewater Treatment Plant
Centrate Purge Stream to Purification	Column Tails	Wastewater Treatment Plant
Floor Drains Area 216 West 216 South	Spills	Cribbed Ditch
Floor Drains Area 213	Spills	Waste Oil Separator to Wastewater Treatment Plant
Area 214 KA Oxidation	Cooling Water	Wastewater Treatment Plant for Heat Recovery
Nylon Intermediates Hexamethylene Diamine		
Hydrogenation Reactor	Once-through cooling water	Cribbed Ditch
Coolers/Condensers	Once-through cooling water	Cribbed Ditch

TABLE 1.0 SOURCES OF WASTEWATER AT DU PONT CANADA INC. - MAITLAND SITE		
Source	**Type**	**Destination**
Ammonia Recovery	Stripper Water	Wastewater Treatment Plant
DCH Stripper	Vacuum-Jet and Stripper Water	Cribbed Ditch
Tails Conc. Column	Vacuum-Jet and Stripper Water	Cribbed Ditch
HMD Refiner Column	Vacuum-Jet and Stripper Water	Cribbed Ditch
Aqua Ammonia Column	Tails	Wastewater Treatment Plant
Building 412 HMD Hydrogeneration	Floor Drain Spills Seal Water	Cribbed Ditch
Building 413 HMD Refining	Floor Drain Spills Seal Water	Cribbed Ditch
Building 311 NH_3 Recovery	Floor Drain Spills	Cribbed Ditch
Three NH_3 Absorbers	Scrubber Water	Wastewater Treatment Plant
Chlorofluorocarbons F11, F12, F22		
Reactor HCl Column	Once-through cooling water	Cribbed Ditch
HCl Absorber	Scrubber Water	Cribbed Ditch
H_20 Scrubber	Scrubber Water	Cribbed Ditch
Caustic Scrubber	Scrubber Water	Cribbed Ditch
Emergency Vent Scrubber	Scrubber Water	Wastewater Treatment Plant
Loading Area (Truck)	Spills/Stormwater	Sump to Wastewater Treatment Plant
Reactor Containment	Spills	Wastewater Treatment Plant
Loading Area (Railcar)	Spills	Cribbed Ditch
Tanks Areas	Spills	Cribbed Ditch
Caustic Tank	Drain Water	Cribbed Ditch
Vacuum Jet	Water	Cribbed Ditch
HCFC - 123		
H_20 Scrubber	Scrubber Water	Cribbed Ditch
Caustic Scrubber	Scrubber Water	Cribbed Ditch
Lycra		
Polymerization Tank	Once-through cooling water	Cribbed Ditch
Solvent Recovery	Condensate	Cribbed Ditch
Cleaning	Nitric Acid	Cribbed Ditch
Solvent Recovery	Reactor Washwater	Off-site Disposal

TABLE 1.0 SOURCES OF WASTEWATER AT DU PONT CANADA INC. - MAITLAND SITE		
Source	**Type**	**Destination**
Tank Farm	Spills and Stormwater	Sump Return
Solvent Recovery Drains	Washwater/Spills	Cribbed Ditch
	Engineering Polymers	
Strand Cooling	Contact Cooling Water	Cribbed Ditch
Strand De-watering	Vacuum Pump Seal Water	Cribbed Ditch
Extruder Gearbox Cooling	Non-contact Cooling Water	Recycled
Floor Drains	Spills	Cribbed Ditch
	Hydrogen Peroxide	
Carbon Filters Clarifier Pit	Process Water Wash Water Phase	Wastewater Treatment Plant
Alumina Bed Regeneration	Washwater (Steam)	Wastewater Treatment Plant
Hydrogenation Tube Reactor Oxidation Column Extractors Concentration Process	Once-through cooling water	Cribbed Ditch
Floor Drains	Spills	Sump to Wastewater Treatment Plant
Tank Area	Spills	Sump to Wastewater Treatment Plant
Ion Exchange Beds	Neutralization/Regeneration Solution	Cribbed Ditch
	Hydrogen	
Coolers/Heat Exchangers	Once-through cooling water	Cribbed Ditch
Boiler	Blowdown	Cribbed Ditch
	Power House	
Boilers	Blowdown	Cribbed Ditch
Compressors	Once-through cooling water	Cribbed Ditch
Ion Exchange Softener	Backwash/Blowdown	Cribbed Ditch
Sand Filters	Backwash	Cribbed Ditch
	Wastewater Treatment Plant	
Aerobic Basin	Wastewater	Detention Ponds and River
Wastewater Treatment Plant	BIOMASS Sludge	Detention Ponds
Groundwater Pumps (CFH Area)	Contaminated Groundwater	Wastewater Treatment Plant
[1] ND - Not determined during site visit		

Table 2.0 Wastewater Sources to MISA Monitoring Locations		
MISA Control Point	**Flow Source**	**Final Destination**
PR 0300	WTP Effluent	Detention ponds/CO 1100
CO 0400	Spent cooling water and scrubber effluent from CFC/HCFC area	Flows into CO 0700
CO 0500	Spent cooling water from engineering polymers, spandex fibers and power house	Detention ponds/CO 1100
CO 0700	Spent cooling water from nylon intermediate, adipic acid, and hexamethyle diamine areas.	Detention ponds/CO 1100
CO 1100	Final Plant Discharge	St. Lawrence River

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period indicated that the discharge from MISA Control Point CO 1100 was acutely lethal to Daphnia Magna. An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity Unit indicated that the causes of toxicity were not conclusive and additional monitoring data will be needed before an assessment can be made. In addition, the plant's intake water samples (MISA Control Point IN 1000) were also determined to be lethal during the months of November 1989, January 1990, and February 1990 (Ref. 2).

Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Point CO 1100 to assess the toxicity problems identified. A series of guidance document for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 3).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that, if installed, will achieve the maximum overall pollutant reduction. The following subsections summarize BAT Option 2 recommendations by MISA Control Point.

3.2.1 MISA Control Point PR 0300 (WTP Effluent)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point PR 0300 showed elevated concentrations of some conventional pollutants and metals.

High levels of contaminants included DOC (50.7 mg/l), TOC (66 mg/l), COD (204 mg/l), ammonia (23.79 mg/l), nitrates (14.40 mg/l), total kjeldahl nitrogen (48.3 mg/l), TSS (293 mg/l), VSS (300 mg/l), phenolics 4AAP (18.7 ug/l), copper (163.4 ug/l), and vanadium (104.5 ug/l).

A review of the plant's processes indicated that zinc and ammonia contamination are contributed largely from the adipic acid and HDMA manufacturing processes while copper contamination is contributed from the cyclohexane oxidation processes. As a result, chemical precipitation for zinc and copper removal is recommended for the process wastewater originating from the adipic acid, HDMA and cyclohexane processing areas, while steam stripping of the process wastewater originating at the adipic acid and HMDA processing areas is recommended for the removal of ammonia.

Upgrades to the existing biological treatment system are recommended for the removal of the high concentrations of the conventional pollutants found at MISA Control Point PR 0300. Adding unit treatment processes to the existing biological treatment systems is one of the methods that plants in the U.S. OCPSF industry were able to improve the performance of their existing biological treatment systems. A review of the BAT treatment systems in-place at other similar U.S. and Ontario organic chemical manufacturing plants achieving BAT performance revealed that the Du Pont Maitland plant's existing biological treatment system is lacking adequate secondary clarification and sludge dewatering. It is expected that with the addition of these two treatment operations the plant's existing biological treatment

system will be able to achieve BAT performance; therefore, secondary clarification and sludge dewatering are recommended for MISA Control Point PR 0300 for BAT Option 2.

In a September 2, 1992 letter to MOE, DuPont Maitland personnel suggested alternative technologies and costs for the PR0300 wastestream including:

- Actual capital and O & M costs for steam stripping of ammonia equal to $980,000 and $170,000 respectively.
- Including a filter along with the cost of a secondary clarifier to meet 15 mg/l TSS, which increases the combined capital and O & M costs to $10,000,000 and $500,000 respectively.
- Suggesting an elevated capital and O & M costs for sludge dewatering and disposal of $3,000.000 and $500,000 respectively.

Since SAIC has not had the opportunity to review the background information on these recommended technologies and associated costs, they have only been referenced here rather than included in our recommendations.

3.2.2 MISA Control Point CO 0400 (CFH Effluent)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0400 showed elevated concentrations of volatile organic pollutants most notably tetrachloroethylene and trichlorofluoromethane. Tetrachloroethylene was detected at an average concentration of 277.7 ug/l while trichlorofluoromethane was detected at an average concentration of 980.8 ug/l/. Steam stripping is recommended for the reduction of trichlorofluoromethane and tetrachloroethylene concentrations as well as other volatile organic pollutants present at MISA Control Point CO 0400. Steam stripping has been demonstrated to be the most effective method of volatile pollutant removal.

In a September 2, 1992 letter to MOE, DuPont Maitland personnel suggested alternative technologies and costs for the CO 0400 wastestream, including:

- Replacing the recommended installation of steam stripping to remove VOCs with granular activated carbon at a cost of $721,200 capital cost and $456,400 O & M cost.

Since SAIC has not had the opportunity to review the background information on this recommended technology and associated costs, they have only been referenced here rather than included in our recommendations.

3.2.3 MISA Control Point CO 0500 (Spandex, Polymers, Powerhouse Effluent)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0500 showed elevated concentrations of some organic pollutants. Although the reported concentrations of these volatile organic pollutants are not considered high for a process wastewater and

since MISA Control Point CO 0500 receives non-contact cooling water only from the spandex, polymers and powerhouse processing areas, development and implementation of a Best Management Practices (BMP) Plan is recommended for MISA Control Point CO 0500 to control the organic pollutants present for BAT Option 2. This pollution prevention approach should focus on the identification of the source(s) and implementation of methods of control of organic pollutants. A draft report prepared by Environment Canada outlines guidelines for a development and implementation of a Best Management Practices (BMP) plan (Ref. 4).

3.2.4 MISA Control Point CO 0700 (Cribbed Ditch Effluent)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0600 showed elevated concentrations of some organic pollutants. High levels of contaminants included DOC (11.3 mg/l), COD (213 mg/l), tetrachloroethylene (128.8 ug/l), trichlorofluoromethane (70.4 ug/l), benzene (51.2 ug/l), acrolein (107 ug/l) and octachlorodibenzo-p-dioxin (210 pq/l). Based on these observed concentrations, granular activated carbon and multimedia filtration are recommended to control these pollutants at MISA Control Point CO 0700 for BAT Option 2.

In a September 2, 1992 letter to MOE, DuPont Maitland personnel suggested alternative technologies and costs for the CO 0700 wastestream including:

- Eliminating the costs for granular activated carbon and multimedia filtration for VOC removal based on removal of trichlorofluoromethane and tetrachloroethylene at CO 0400.
- Including a stream segregation project to lower DOC/COD levels at a capital cost of $2,500,000 and an O & M cost of $250,000.

Since SAIC has not had the opportunity to review the background information on these recommended approaches and associated costs, they have only been referenced here rather than included in our recommendations.

3.2.5 MISA Control Point CO 1100 (Final Effluent to River)

The analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 1100 showed elevated concentrations of tetrachloroethylene (18.4 ug/l), trichlorofluoromethane (16.3 ug/l), copper (93.3 ug/l) and total TCDD (665.0 pq/l). Although reductions in these concentrations are expected with the implementation of the BAT technologies recommended for MISA Control Points PR 0300, CO 0400, CO 0500, and CO 0700, the development and implementation of a Best Management Practices (BMP) Plan is recommended at MISA Control Point CO 1100 for BAT Option 2 to further

control these pollutants. This pollution prevention approach should focus on the identification of the source(s) and implementation of methods of control of organic pollutants. A draft report prepared by Environment Canada outlines guidelines for a development and implementation of a Best Management Practices (BMP) plan (Ref. 8).

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant farthest toward virtual elimination and the ultimate goal of zero discharge of contaminants including current technologies or a combination of current technologies, supplemental/additional technologies or cross-over technologies from other industrial sectors. It should be noted that the technologies recommended for BAT Option 3 are in addition of the BAT technologies already recommended under BAT Options 1 and 2.

3.2.1 MISA Control Point PR 0300 (WTP Effluent)

Based on the pollutant concentrations found during the MISA monitoring period, granular activated carbon and multimedia filtration are recommended at MISA Control Point PR 0300 for BAT Option 3. Granular activated carbon will further reduce DOC, TOC, COD, and phenolics (4AAP) effluent concentrations as well as other VOCs present in the wastestream. The addition of multimedia filtration will also reduce TSS and metals effluent concentrations.

3.2.2 MISA Control Point CO 0400 (CFH Effluent) and MISA Control Point CO 0700 (Cribbed Ditch Effluent)

Based on the pollutant concentrations found during the MISA Twelve Month Monitoring Period, the pollutant reductions that are expected to be achieved with the addition of steam stripping for BAT Option 2 at MISA Control Point CO 0400, and the fact that the discharge from MISA Control Point CO 0400 flows to MISA Control Point CO 0700 (which will be further treated with granular activated carbon for BAT Option 2), no additional treatment is recommended for BAT Option 3 at MISA Control Points CO 0400 and CO 0700.

3.2.3 MISA Control Point CO 0500 (Spandex, Polymer, Powerhouse Effluent)

Based on the pollutant concentrations found during the MISA Twelve Month Monitoring Period, it was determined that granular activated carbon and multimedia filtration are recommended for MISA Control Point CO 0500. DOC, COD, TOC, and phenolics (4AAP) effluent concentrations as well as other pollutants present in these wastestreams will be further reduced with the addition of multimedia filtration and granular activated carbon.

3.2.4 MISA Control Point CO 1100 (Combined Effluent to River)

Based on the contaminants present in the plant's only direct discharge to the river and the pollutant reduction expected to be achieved with the installation of the technologies recommended under BAT Options 2 and 3 for the discharges which make up the final discharge, no additional treatment is recommended for MISA Control Point CO 1100 for BAT Option 3.

3.4 SUMMARY OF BAT OPTIONS

Table 3.0 presents a summary of the BAT Options recommended for Du Pont Canada Inc. - Maitland Site for MISA Control Points PR 0300, CO 0400, CO 0500, CO 0700 and CO 1100.

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

TABLE 3.0
SUMMARY OF BAT OPTIONS FOR DU PONT CANADA INC. - MAITLAND SITE

BAT OPTION	DEFINITION	DESCRIPTION
A) MISA CONTROL POINT PR 0300 (WTP EFFLUENT FLOWS TO CO 1100)		
1	Non-lethal effluent	No toxicity testing
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater from adipic acid and HMDA areas to chemical precipitation (copper, zinc) and steam stripping (ammonia) with process wastewater from cyclohexane oxidation to chemical precipitation only (copper). Secondary clarification and sludge dewatering.
3	Zero Discharge/Virtual Elimination	BAT Option 2 plus granular activated carbon and multimedia filtration
B) MISA CONTROL POINT CO 0400 (CFH EFFLUENT FLOW INTO CO 0700)		
1	Non-lethal effluent	No toxicity testing
2	USA/Ontario BAT/Maximum Pollutant Reduction	Steam stripping of CFH process wastewater
3	Zero Discharge/Virtual Elimination	Equal to BAT Option 2

TABLE 3.0 SUMMARY OF BAT OPTIONS FOR DU PONT CANADA INC. - MAITLAND SITE		
BAT OPTION	DEFINITION	DESCRIPTION
C) MISA CONTROL POINT CO 0500 (SPANDEX, POLYMERS, POWERHOUSE EFFLUENT FLOWS INTO CO 1100)		
1	Non-lethal effluent	No toxicity testing
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMP (Organics)
3	Zero Discharge/Virtual Elimination	Granular Activated Carbon/Multimedia Filtration
D) MISA CONTROL POINT CO 0700 (CRIBBED DITCH FLOWS INTO CO 1100)		
1	Non-lethal effluent	No toxicity testing
2	USA/Ontario BAT/Maximum Pollutant Reduction	Granular Activated Carbon/Multimedia Filtration
3	Zero Discharge/Virtual Elimination	Same as BAT Option 2
E) MISA CONTROL POINT CO 1100 (SITE COMBINED EFFLUENT TO RIVER)		
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMP (Copper, TCDD)
3	Zero Discharge/Virtual Elimination	Same as BAT Option 2

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry wide basis. The average flow rate as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste- specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates for the control technologies considered for Du Pont Canada - Maitland Site plant for chemical precipitation, steam stripping, secondary clarification, sludge dewatering, granular activated carbon and multimedia filtration were taken from the cost curves developed in the Development

Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibres Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 5).

Table 4.0 presents the cost estimates developed for the technologies considered for each BAT Options for MISA Control Points PR 0300, CO 0400, CO 0500 and CO 0700 at Du Pont Canada - Maitland site. Cost estimates for development and implementation of a TIE Study could not be developed due to the site-specific nature of the study.

TABLE 4.0
BAT OPTIONS COST ESTIMATES
DU PONT CANADA INC. - MAITLAND SITE

MISA CONTROL POINT		BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
	DESIGN FLOW (M^3/DAY	CAPITAL COST ($)	O&M COST $/YEAR	TECHNOLOGY	CAPITAL COST ($)	O&M COST $/YEAR	TECHNOLOGY	CAPIT L COST ($)	O&M COST ($/YEAR)	TECHNOLOGY
PR 0300	6,500	0	0	NAT	1,550,800 2,439,700 1,058,000 475,800 5,524,300	263,000 8,989,900 157,200 40,700 9,450,800	CP SS CLAR SLUDGE TOTAL	5,524,300 11,601,700 1,311,700 18,437,700	9,450,800 1,038,400 97,500 10,586,700	OPTION 2 GAC FIL TOTAL
CO 0400	6,477	0	0	NAT	2,202,600	6,082,250	SS	2,202,600	6,082,250	SS
CO 0500	17,088	0	0	NAT	NA	NA	BMPs	18,334,200 1,739,600 20,073,800	1,893,700 118,200 2,011,900	GAC FIL TOTAL
CO 0700	61,363	0	0	NAT	53,186,700 2,977,700 56,164,400	5,803,100' 168,100 5,971,200	GAC FIL TOTAL	56,164,400	5,971,200	Same as Option 2
CO 1100	229,267	NA	NA	TIE	NA	NA	BMPs	NA	NA	BMPs

NOTES:

NAT - No additional treatment
NA - Cost Estimates not developed
CP - Chemical Precipitation
SS - Steam Stripping
BMP's - Best Management Practices
CLAR - Secondary Clarification
Sludge - Sludge Dewatering
GAC - Granular Activated Carbon
FIL - Multimedia Filtration
TIE - Toxicity Investigation Evaluation

6.0 REFERENCES

1. DuPont Canada Inc. - Maitland Site - BAT Status of OCM Sector Plants Site Visit Information Report, April 8-9, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirier, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Application to Ontario's MISA Program", May 1987.

5. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA
FOR DU PONT CANADA INC. - MAITLAND SITE

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – MAITLAND

ATG	PARAMETER	RMDL	UNIT	IN 1000	PR 0300	CO 0400	CO 0500	CO 0700	CO 1100
1	COD	10	mg/L	11	204	11	15	213	61
2	Cyanide Total	0.005	mg/L	0.005	0.207	0.005	0.018	0.016	0.040
3	Hydrogen ion (pH)			8.1	8.2	8.6	7.5	7.9	7.7
4	Ammonia plus Ammonium	0.25	mg/L	0.10	23.79	0.14	0.19	0.19	1.01
4	Nitrate+Nitrite	0.25	mg/L	0.30	14.40	0.35	4.28	1.06	2.70
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	48.3	0.3	1.0	1.0	6.2
5	DOC	0.5	mg/L	2.3	50.7	2.6	4.6	11.3	6.3
5	TOC	5	mg/L	45	66	3	4	4	9
6	Total phosphorus	0.10	mg/L	0.10	4.23	0.10	0.10	0.10	0.62
7	Specific conductance	5	uS/cm	307	1776	1035	486	463	388
8	Total suspended solids	5	mg/L	15	293	14	6	7	25
8	Volatile suspended solids	10	mg/L	5	300	4	5	5	17
9	Aluminum	30.0	ug/L	238.3	193.3	100.0	55.0	62.5	158.3
9	Boron	50.0	ug/L	55.8	59.2	100.0	57.5	50.0	55.8
9	Chromium	20.0	ug/L	19.2	41.7	20.0	20.8	20.0	21.7
9	Cobalt	20.0	ug/L	20.0	184.7	20.0	20.0	20.0	22.9
9	Copper	10.0	ug/L	10.8	163.4	10.0	20.8	35.0	93.3
9	Nickel	20.0	ug/L	10.0	18.3	12.5	10.0	10.0	10.0
9	Vanadium	30.0	ug/L	20.0	104.5	20.0	20.0	22.5	20.0
9	Zinc	10.0	ug/L	11.7	61.7	10.0	10.0	10.0	63.3
10	Antimony	5.0	ug/L	2.0	2.1	132.8	2.0	3.3	13.5
10	Arsenic	5.0	ug/L	2.0	2.0	18.9	2.0	2.0	2.1
14	Phenolics (4AAP)	2.0	ug/L	1.3	18.7	4.6	3.1	4.4	6.1
15	Sulphide	20.0	ug/L	10.0	20.8	16.5	10.0	10.0	10.0

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – MAITLAND

ATG	PARAMETER	RMDL	UNIT	IN 1000	PR 0300	CO 0400	CO 0500	CO 0700	CO 1100
16	1,1,2,2–Tetrachloroethane	4.3	ug/L	1.0	4.3	143.4	26.8	26.8	1.3
16	1,1,2–Trichloroethane	0.6	ug/L	0.2	0.9	27.8	5.4	5.4	0.3
16	1,1–Dichloroethane	0.8	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	1,1–Dichloroethylene	2.8	ug/L	0.5	2.1	55.8	13.4	13.4	0.7
16	1,2–Dichlorobenzene	1.4	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	1,2–Dichloroethane	0.8	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	1,2–Dichloropropane	0.9	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	1,3–Dichlorobenzene	1.1	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	1,4–Dichlorobenzene	1.7	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	Bromodichloromethane	0.8	ug/L	0.8	0.9	30.5	6.0	6.5	0.8
16	Bromoform	3.7	ug/L	2.0	8.5	223.3	53.5	53.5	2.7
16	Bromomethane	3.7	ug/L	2.0	8.5	223.3	53.5	53.5	2.7
16	Carbon tetrachloride	1.3	ug/L	0.2	0.9	143.7	6.1	9.6	1.0
16	Chlorobenzene	0.7	ug/L	0.2	0.9	22.3	5.4	5.5	0.3
16	Chloroform	0.7	ug/L	2.4	1.4	71.3	7.5	9.3	2.1
16	Chloromethane	3.7	ug/L	2.0	8.5	223.3	53.5	53.5	2.7
16	Cis–1,3–Dichloropropylene	1.4	ug/L	0.5	2.1	55.8	13.4	13.4	0.7
16	Dibromochloromethane	1.1	ug/L	1.0	4.3	143.4	26.8	26.9	1.3
16	Ethylene dibromide	1.0	ug/L	1.0	4.3	111.7	26.8	26.8	1.3
16	Methylene chloride	1.3	ug/L	0.5	2.2	70.0	1.2	1.2	0.8
16	Tetrachloroethylene	1.1	ug/L	0.5	2.1	277.7	15.0	128.8	18.4
16	Trans–1,2–Dichloroethylene	1.4	ug/L	0.2	0.9	22.3	5.4	5.4	0.3
16	Trans–1,3–Dichloropropylene	1.4	ug/L	0.5	2.1	55.8	13.4	13.4	0.7
16	Trichloroethylene	1.9	ug/L	0.2	0.9	22.3	5.4	5.4	2.0
16	Trichlorofluoromethane	1.0	ug/L	1.0	4.3	980.8	33.2	70.4	16.3
16	Vinyl chloride	4.0	ug/L	2.0	8.5	223.3	53.5	53.5	2.7

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – MAITLAND

ATG	PARAMETER	RMDL	UNIT	IN 1000	PR 0300	CO 0400	CO 0500	CO 0700	CO 1100
17	Benzene	0.5	ug/L	0.1	0.7	9.0	3.6	51.2	0.7
17	Ethylbenzene	0.6	ug/L	0.2	0.9	16.0	5.4	5.4	0.3
17	Styrene	0.5	ug/L	0.2	0.9	16.0	5.4	5.4	0.3
17	Toluene	0.5	ug/L	0.2	0.9	16.0	5.4	5.4	0.5
17	m–Xylene and p–Xylene	1.1	ug/L	0.2	1.4	16.0	5.4	5.5	0.4
17	o–Xylene	0.5	ug/L	0.2	0.9	16.0	5.4	5.4	0.3
18	Acrolein	4.0	ug/L	4.0	111.0	320.0	107.0	107.0	8.0
18	Acrylonitrile	4.2	ug/L	2.0	55.5	160.0	53.5	53.5	4.0
19	Diphenyl ether	0.4	ug/L	0.4	89.8	0.4	2.1	5.3	0.5
23	1,2,4–Trichlorobenzene	10.0	ng/L	5.5	6.8	46.8	5.3	6.3	6.3
23	Hexachlorobenzene	10.0	ng/L	5.5	6.7	194.8	5.0	5.8	6.1
23	Hexachlorobutadiene	10.0	ng/L	5.3	6.8	19.5	5.0	6.3	5.6
23	Hexachloroethane	10.0	ng/L	5.3	6.7	98.5	5.0	10.0	12.6
24	Total TCDD	20.0	pg/L	20.0	58.0	37.5	20.0	20.0	665.0
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	32.5	85.0	48.3	50.3	210.0	97.5
24	Octachlorodibenzofuran	30.0	pg/L	30.0	30.0	125.5	30.0	49.0	42.5
25	Oil and grease	1.0	mg/L	1.0	6.4	1.1	1.3	1.1	2.5
98	Ftflow		m3/day	–	4895	5512	14233	53777	191263

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation
(ii) The average loading of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average loading values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS

IN 1000 – Intake Water to Site
PR 0300 – WTP Effluent flows into CO 1100
CO 0400 – CFH Effluent flows into CO 0700
CO 0500 – Spandex, Polymers, Powerhouse Effluent flows into CO 1100
CO 0700 – Cribbed Ditch flows into CO 1100
CO 1100 – Site Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – MAITLAND

ATG	PARAMETER	IN 1000	PR 0300	CO 0400	CO 0500	CO 700	CO 1100	TOTAL
1	COD	2114.000	1099.875	62.400	210.250	13266.850	11417.000	11417.000
2	Cyanide Total	0.972	1.051	0.029	0.263	0.824	7.669	7.669
4	Ammonia plus Ammonium	19.880	112.455	0.809	2.551	10.043	193.868	193.868
4	Nitrate+Nitrite	57.445	68.113	2.128	58.984	55.151	511.600	511.600
4	Total Kjeldahl Nitrogen	64.578	227.992	1.697	14.298	53.262	1335.407	1335.407
5	DOC	433.978	295.951	14.161	60.208	589.187	1180.381	1180.381
5	TOC	6813.114	378.370	20.581	46.905	260.750	1848.404	1848.404
6	Total phosphorus	19.493	19.319	0.546	1.442	5.572	128.217	128.217
8	Total suspended solids	2842.950	1459.420	79.746	82.362	363.772	5356.933	5356.933
8	Volatile suspended solids	997.500	1536.931	25.721	69.750	283.250	3424.000	3424.000
9	Aluminum	53.257	0.850	0.599	0.685	3.668	34.431	34.431
9	Boron	10.905	0.329	0.591	0.819	2.832	10.918	10.918
9	Chromium	3.782	0.193	0.116	0.292	1.133	4.363	4.363
9	Cobalt	3.940	0.858	0.116	0.283	1.133	4.354	4.354
9	Copper	2.146	0.829	0.058	0.294	1.937	18.728	18.728
9	Nickel	1.970	0.092	0.073	0.142	0.566	1.970	1.970
9	Vanadium	3.940	0.493	0.116	0.283	1.290	3.940	3.940
9	Zinc	2.353	0.303	0.058	0.142	0.566	11.803	11.803
10	Antimony	0.378	0.011	0.688	0.028	0.192	2.689	2.689
10	Arsenic	0.390	0.010	0.100	0.028	0.113	0.409	0.409
14	Phenolics (4AAP)	0.247	0.094	0.028	0.042	0.256	1.142	1.142
15	Sulphide	1.995	0.109	0.097	0.139	0.566	1.995	1.995

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – MAITLAND

ATG	PARAMETER	IN 1000	PR 0300	CO 0400	CO 0500	CO 0700	CO 1100	TOTAL
16	1,1,2,2–Tetrachloroethane	0.197	0.022	0.817	0.316	1.667	0.259	0.259
16	1,1,2–Trichloroethane	0.044	0.004	0.150	0.063	0.333	0.056	0.056
16	1,1–Dichloroethane	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	1,1–Dichloroethylene	0.098	0.011	0.300	0.158	0.833	0.130	0.130
16	1,2–Dichlorobenzene	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	1,2–Dichloroethane	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	1,2–Dichloropropane	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	1,3–Dichlorobenzene	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	1,4–Dichlorobenzene	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	Bromodichloromethane	0.174	0.004	0.169	0.072	0.399	0.153	0.153
16	Bromoform	0.394	0.043	1.198	0.632	3.334	0.518	0.518
16	Bromomethane	0.394	0.043	1.198	0.632	3.334	0.518	0.518
16	Carbon tetrachloride	0.039	0.004	0.799	0.075	0.570	0.190	0.190
16	Chlorobenzene	0.039	0.004	0.120	0.063	0.341	0.052	0.052
16	Chloroform	0.491	0.006	0.421	0.094	0.561	0.407	0.407
16	Chloromethane	0.394	0.043	1.198	0.632	3.334	0.518	0.518
16	Cis–1,3–Dichloropropylene	0.098	0.011	0.300	0.158	0.833	0.130	0.130
16	Dibromochloromethane	0.197	0.022	0.817	0.316	1.675	0.259	0.259
16	Ethylene dibromide	0.197	0.022	0.599	0.316	1.667	0.259	0.259
16	Methylene chloride	0.098	0.011	0.376	0.018	0.061	0.153	0.153
16	Tetrachloroethylene	0.098	0.011	1.610	0.183	8.064	3.641	3.641
16	Trans–1,2–Dichloroethylene	0.039	0.004	0.120	0.063	0.333	0.052	0.052
16	Trans–1,3–Dichloropropylene	0.098	0.011	0.300	0.158	0.833	0.130	0.130
16	Trichloroethylene	0.039	0.004	0.120	0.063	0.333	0.420	0.420
16	Trichlorofluoromethane	0.197	0.022	5.220	0.416	4.221	2.910	2.910
16	Vinyl chloride	0.394	0.043	1.198	0.632	3.334	0.518	0.518

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – MAITLAND

ATG	PARAMETER	IN 1000	PR 0300	CO 0400	CO 0500	CO 0700	CO 1100	TOTAL
17	Benzene	0.020	0.004	0.052	0.045	3.218	0.128	0.128
17	Ethylbenzene	0.039	0.004	0.091	0.063	0.333	0.052	0.052
17	Styrene	0.039	0.004	0.091	0.063	0.333	0.052	0.052
17	Toluene	0.039	0.004	0.091	0.063	0.333	0.086	0.086
17	m–Xylene and p–Xylene	0.041	0.007	0.091	0.064	0.341	0.069	0.069
17	o–Xylene	0.039	0.004	0.091	0.063	0.333	0.052	0.052
18	Acrolein	0.749	0.637	1.832	1.264	6.667	1.542	1.542
18	Acrylonitrile	0.375	0.319	0.916	0.632	3.334	0.771	0.771
19	Diphenyl ether	0.080	0.520	0.003	0.031	0.270	0.089	0.089
23	1,2,4–Trichlorobenzene	0.001	*	*	*	*	0.001	0.001
23	Hexachlorobenzene	0.001	*	0.001	*	*	0.001	0.001
23	Hexachlorobutadiene	0.001	*	*	*	*	0.001	0.001
23	Hexachloroethane	0.001	*	0.001	*	0.001	0.002	0.002
24	Total TCDD	*	*	*	*	*	*	*
24	Octachlorodibenzo–p–dioxin	*	*	*	*	*	*	*
24	Octachlorodibenzofuran	*	*	*	*	*	*	*
25	Oil and grease	194.265	31.042	6.258	19.127	57.570	530.980	530.980

EXPLANATORY NOTES:
(i) "–" not required by the regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 1000 – Intake Water to Site
PR 0300 – WTP Effluent flows into CO 1100
CO 0400 – CFH Effluent flows into CO 0700
CO 0500 – Spandex,Polymers,Powerhouse Effluent flows into CO 1100
CO 0700 – Cribbed Ditch flows into CO 1100
CO 1100 – Site Effluent to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS FOR DU PONT CANADA INC. - MAITLAND SITE

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - PR 0300 WTP Effluent flows into CO 1100
AVERAGE FLOWRATE = 4895 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	204	1099.875	204	1099.875	69	337.755	31	151.745	DupM	Polysar	Esso
2	Cyanide Total	0.005	mg/L	0.207	1.051	0.207	1.051	0.207	1.051	0.207	1.051	DupM	DupM	DupM
4	Ammonia plus Ammonium	0.25	mg/L	23.79	112.455	23.79	112.455	1.57	7.685	1.57	7.685	DupM	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	14.40	68.113	14.40	68.113	2.15	10.524	2.15	10.524	DupM	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	48.3	227.992	48.3	227.992	2.3	11.259	2.3	11.259	DupM	Polysar	Polysar
5	DOC	0.5	mg/L	50.7	295.951	50.7	295.951	16.7	81.747	4.4	21.538	DupM	Polysar	Esso
5	TOC	5	mg/L	66	378.370	66	378.370	15	73.425	5	24.475	DupM	Polysar	Esso
6	Total phosphorus	0.10	mg/L	4.23	19.319	4.23	19.319	0.71	3.475	0.71	3.475	DupM	Polysar	Polysar
8	Total suspended solids	5	mg/L	293	1459.420	293	1459.420	15	73.425	5	24.475	DupM	Polysar	P1774
8	Volatile suspended solids	10	mg/L	300	1536.931	300	1536.931	8	39.160	8	39.160	DupM	Polysar	Polysar
9	Aluminum	30.0	ug/L	193.3	0.850	193.3	0.850	193.3	0.850	47.0	0.230	DupM	DupM	RREL
9	Boron	50.0	ug/L	59.2	0.329	59.2	0.329	59.2	0.329	59.2	0.329	DupM	DupM	DupM
9	Chromium	20.0	ug/L	41.7	0.193	41.7	0.193	41.7	0.193	17.0	0.083	DupM	DupM	RREL
9	Cobalt	20.0	ug/L	184.7	0.858	184.7	0.858	25.0	0.122	25.0	0.122	DupM	RREL	RREL
9	Copper	10.0	ug/L	163.4	0.829	163.4	0.829	13.0	0.064	13.0	0.064	DupM	RREL	RREL
9	Nickel	20.0	ug/L	18.3	0.092	18.3	0.092	18.3	0.092	18.3	0.092	DupM	DupM	DupM
9	Vanadium	30.0	ug/L	104.5	0.493	104.5	0.493	13.0	0.064	13.0	0.064	DupM	RREL	RREL
9	Zinc	10.0	ug/L	61.7	0.303	61.7	0.303	61.7	0.303	61.7	0.303	DupM	DupM	DupM
10	Antimony	5.0	ug/L	2.1	0.011	2.1	0.011	2.1	0.011	2.1	0.011	DupM	DupM	DupM
10	Arsenic	5.0	ug/L	2.0	0.010	2.0	0.010	2.0	0.010	2.0	0.010	DupM	DupM	DupM
14	Phenolics (4AAP)	2.0	ug/L	18.7	0.094	18.7	0.094	10.1	0.049	2.5	0.012	DupM	Polysar	Esso
15	Sulphide	20.0	ug/L	20.8	0.109	20.8	0.109	20.8	0.109	20.8	0.109	DupM	DupM	DupM
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	12.3	0.069	12.3	0.069	12.3	0.060	12.3	0.060	DupM	DupM	DupM
16	1,1,2-Trichloroethane	0.6	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	1,1-Dichloroethane	0.8	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	1,1-Dichloroethylene	2.8	ug/L	6.1	0.034	6.1	0.034	6.1	0.034	6.1	0.034	DupM	DupM	DupM
16	1,2-Dichlorobenzene	1.4	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	1,2-Dichloroethane	0.8	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	1,2-Dichloropropane	0.9	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	1,3-Dichlorobenzene	1.1	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	1,4-Dichlorobenzene	1.7	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	Bromodichloromethane	0.8	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	0.4	0.002	DupM	DupM	Esso
16	Bromoform	3.7	ug/L	24.5	0.137	24.5	0.137	24.5	0.137	24.5	0.137	DupM	DupM**	DupM**
16	Bromomethane	3.7	ug/L	24.5	0.137	24.5	0.137	24.5	0.137	24.5	0.137	DupM	DupM**	DupM**
16	Carbon tetrachloride	1.3	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	Chlorobenzene	0.7	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	Chloroform	0.7	ug/L	1.8	0.009	1.8	0.009	1.8	0.009	1.2	0.006	DupM	DupM	Esso
16	Chloromethane	3.7	ug/L	24.5	0.137	24.5	0.137	24.5	0.137	5.0	0.024	DupM	DupM	RREL

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - PR 0300 WTP Effluent flows into CO 1100
AVERAGE FLOWRATE = 4895 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVL RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Cis-1,3-Dichloropropylene	1.4	ug/L	6.1	0.034	6.1	0.034	6.1	0.034	6.1	0.034	DupM	DupM	DupM
16	Dibromochloromethane	1.1	ug/L	12.3	0.069	12.3	0.069	12.3	0.069	12.3	0.069	DupM	DupM	DupM
16	Ethylene dibromide	1.0	ug/L	12.3	0.069	12.3	0.069	12.3	0.069	12.3	0.069	DupM	DupM	DupM
16	Methylene chloride	1.3	ug/L	2.2	0.011	2.2	0.011	2.2	0.011	2.2	0.011	DupM	DupM	DupM
16	Tetrachloroethylene	1.1	ug/L	6.1	0.034	6.1	0.034	6.1	0.034	2.1	0.010	DupM	DupM	Esso
16	Trans-1,2-Dichloroethylene	1.4	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	Trans-1,3-Dichloropropylene	1.4	ug/L	6.1	0.034	6.1	0.034	6.1	0.034	6.1	0.034	DupM	DupM	DupM
16	Trichloroethylene	1.9	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
16	Trichlorofluoromethane	1.0	ug/L	12.3	0.069	12.3	0.069	12.3	0.069	12.3	0.069	DupM	DupM	DupM
16	Vinyl chloride	4.0	ug/L	24.5	0.137	24.5	0.137	24.5	0.137	2.6	0.013	DupM	DupM	Esso
17	Benzene	0.5	ug/L	1.5	0.009	1.5	0.009	1.5	0.009	1.5	0.009	DupM	DupM	DupM
17	Ethylbenzene	0.6	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
17	Styrene	0.5	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
17	Toluene	0.5	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
17	m-Xylene and p-Xylene	1.1	ug/L	3.0	0.016	3.0	0.016	3.0	0.016	3.0	0.016	DupM	DupM	DupM
17	o-Xylene	0.5	ug/L	2.5	0.014	2.5	0.014	2.5	0.014	2.5	0.014	DupM	DupM	DupM
18	Acrolein	4.0	ug/L	111.0	0.637	111.0	0.637	4.2	0.021	4.2	0.021	DupM	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	55.5	0.319	55.5	0.319	2.8	0.014	2.8	0.014	DupM	Polysar	Polysar
19	Diphenyl ether	0.4	ug/L	89.8	0.520	89.8	0.520	10.0	0.049	10.0	0.049	DupM	RREL	RREL
23	1,2,4-Trichlorobenzene	10.0	ng/L	6.8	*	6.8	*	6.8	*	6.8	*	DupM	DupM	DupM
23	Hexachlorobenzene	10.0	ng/L	6.7	*	6.7	*	6.7	*	6.7	*	DupM	DupM	DupM
23	Hexachlorobutadiene	10.0	ng/L	6.8	*	6.8	*	6.8	*	6.8	*	DupM	DupM	DupM
23	Hexachloroethane	10.0	ng/L	6.7	*	6.7	*	6.7	*	6.7	*	DupM	DupM	DupM
24	Total TCDD	20.0	pg/L	58.0	*	58.0	*	58.0	*	58.0	*	DupM	DupM	DupM
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	85.0	*	85.0	*	85.0	*	85.0	*	DupM	DupM	DupM
24	Octachlorodibenzofuran	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupM	DupM	DupM
25	Oil and grease	1.0	mg/L	6.4	31.042	6.4	31.042	3.8	18.601	3.8	18.601	DupM	Polysar	Polysar

* - Less than 1 gram per day

** - No performance date but reductions are anticipated based on the addition of steam stripping for BAT Option 2 and granular activated carbon and multi-media filtration for BAT Option 3.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 0400 CFH Effluent flows into CO 0700
AVERAGE FLOWRATE = 5512 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3**
1	COD	10	mg/L	11	62.400	11	62.400	11	62.400	11	62.400	DupM	DupM	DupM
2	Cyanide Total	0.005	mg/L	0.005	0.029	0.005	0.029	0.005	0.029	0.005	0.029	DupM	DupM	DupM
4	Ammonia plus Ammonium	0.25	mg/L	0.14	0.809	0.14	0.809	0.14	0.809	0.14	0.809	DupM	DupM	DupM
4	Nitrate+Nitrite	0.25	mg/L	0.35	2.128	0.35	2.128	0.35	2.128	0.35	2.128	DupM	DupM	DupM
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	1.697	0.3	1.697	0.3	1.697	0.3	1.697	DupM	DupM	DupM
5	DOC	0.5	mg/L	2.6	14.161	2.6	14.161	2.6	14.161	2.6	14.161	DupM	DupM	DupM
5	TOC	5	mg/L	3	20.581	3	20.581	3	20.581	3	20.581	DupM	DupM	DupM
6	Total phosphorus	0.10	mg/L	0.10	0.546	0.10	0.546	0.10	0.546	0.10	0.546	DupM	DupM	DupM
8	Total suspended solids	5	mg/L	14	79.746	14	79.746	14	79.746	14	79.746	DupM	DupM	DupM
8	Volatile suspended solids	10	mg/L	4	25.721	4	25.721	4	25.721	4	25.721	DupM	DupM	DupM
9	Aluminum	30.0	ug/L	100.0	0.599	100.0	0.599	100.0	0.599	100.0	0.599	DupM	DupM	DupM
9	Boron	50.0	ug/L	100.0	0.591	100.0	0.591	100.0	0.591	100.0	0.591	DupM	DupM	DupM
9	Chromium	20.0	ug/L	20.0	0.116	20.0	0.116	20.0	0.116	20.0	0.116	DupM	DupM	DupM
9	Cobalt	20.0	ug/L	20.0	0.116	20.0	0.116	20.0	0.116	20.0	0.116	DupM	DupM	DupM
9	Copper	10.0	ug/L	10.0	0.058	10.0	0.058	10.0	0.058	10.0	0.058	DupM	DupM	DupM
9	Nickel	20.0	ug/L	12.5	0.073	12.5	0.073	12.5	0.073	12.5	0.073	DupM	DupM	DupM
9	Vanadium	30.0	ug/L	20.0	0.116	20.0	0.116	20.0	0.116	20.0	0.116	DupM	DupM	DupM
9	Zinc	10.0	ug/L	10.0	0.058	10.0	0.058	10.0	0.058	10.0	0.058	DupM	DupM	DupM
10	Antimony	5.0	ug/L	132.8	0.688	132.8	0.688	132.8	0.688	132.8	0.688	DupM	DupM	DupM
10	Arsenic	5.0	ug/L	18.9	0.100	18.9	0.100	18.9	0.100	18.9	0.100	DupM	DupM	DupM
14	Phenolics (4AAP)	2.0	ug/L	4.6	0.028	4.6	0.028	4.6	0.028	4.6	0.028	DupM	DupM	DupM
15	Sulphide	20.0	ug/L	16.5	0.097	16.5	0.097	16.5	0.097	16.5	0.097	DupM	DupM	DupM
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	174.5	1.002	174.5	1.002	174.5	1.002	174.5	1.002	DupM	DupM***	DupM
16	1,1,2-Trichloroethane	0.6	ug/L	27.8	0.150	27.8	0.150	27.8	0.150	27.8	0.150	DupM	DupM	DupM
16	1,1-Dichloroethane	0.8	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	1,1-Dichloroethylene	2.8	ug/L	55.8	0.300	55.8	0.300	55.8	0.300	55.8	0.300	DupM	DupM	DupM
16	1,2-Dichlorobenzene	1.4	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	1,2-Dichloroethane	0.8	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	1,2-Dichloropropane	0.9	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	1,3-Dichlorobenzene	1.1	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	1,4-Dichlorobenzene	1.7	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	Bromodichloromethane	0.8	ug/L	30.5	0.169	30.5	0.169	30.5	0.169	30.5	0.169	DupM	DupM	DupM
16	Bromoform	3.7	ug/L	223.3	1.198	223.3	1.198	223.3	1.198	223.3	1.198	DupM	DupM	DupM
16	Bromomethane	3.7	ug/L	223.3	1.198	223.3	1.198	223.3	1.198	223.3	1.198	DupM	DupM	DupM
16	Carbon tetrachloride	1.3	ug/L	143.7	0.799	143.7	0.799	7.0	0.039	7.0	0.039	DupM	RREL	RREL
16	Chlorobenzene	0.7	ug/L	22.3	0.120	22.3	0.120	22.3	0.120	22.3	0.120	DupM	DupM	DupM
16	Chloroform	0.7	ug/L	71.3	0.421	71.3	0.421	71.3	0.421	71.3	0.421	DupM	DupM	DupM
16	Chloromethane	3.7	ug/L	223.3	1.198	223.3	1.198	ND(50)	0.276	ND(50)	0.276	DupM	725T	725T

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 0400 CFH Effluent flows into CO 0700
AVERAGE FLOWRATE = 5512 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3**
16	Cis-1,3-Dichloropropylene	1.4	ug/L	55.8	0.300	55.8	0.300	55.8	0.300	55.8	0.300	DupM	DupM***	DupM
16	Dibromochloromethane	1.1	ug/L	143.4	0.817	143.4	0.817	143.4	0.817	143.4	0.817	DupM	DupM	DupM
16	Ethylene dibromide	1.0	ug/L	111.7	0.599	111.7	0.599	111.7	0.599	111.7	0.599	DupM	DupM	DupM
16	Methylene chloride	1.3	ug/L	70.0	0.376	70.0	0.376	ND(10)	0.055	ND(10)	0.055	DupM	913P	913P
16	Tetrachloroethylene	1.1	ug/L	277.7	1.610	277.7	1.610	18.4	0.102	18.4	0.102	DupM	913P	913P
16	Trans-1,2-Dichloroethylene	1.4	ug/L	22.3	0.120	22.3	0.120	ND(10)	0.055	ND(10)	0.055	DupM	913P	913P
16	Trans-1,3-Dichloropropylene	1.4	ug/L	55.8	0.300	55.8	0.300	55.8	0.300	55.8	0.300	DupM	DupM	DupM
16	Trichloroethylene	1.9	ug/L	22.3	0.120	22.3	0.120	ND(10)	0.055	ND(10)	0.055	DupM	913P	913P
16	Trichlorofluoromethane	1.0	ug/L	980.8	5.220	980.8	5.220	980.8	5.220	980.8	5.220	DupM	DupM***	DupM
16	Vinyl chloride	4.0	ug/L	223.3	1.198	223.3	1.198	ND(50)	0.276	ND(50)	0.276	DupM	913P	913P
17	Benzene	0.5	ug/L	9.0	0.052	9.0	0.052	9.0	0.052	9.0	0.052	DupM	DupM***	DupM
17	Ethylbenzene	0.6	ug/L	16.0	0.091	16.0	0.091	16.0	0.091	16.0	0.091	DupM	DupM***	DupM
17	Styrene	0.5	ug/L	16.0	0.091	16.0	0.091	16.0	0.091	16.0	0.091	DupM	DupM***	DupM
17	Toluene	0.5	ug/L	16.0	0.091	16.0	0.091	12.0	0.066	12.0	0.066	DupM	415T	415T
17	m-Xylene and p-Xylene	1.1	ug/L	16.0	0.091	16.0	0.091	16.0	0.091	16.0	0.091	DupM	DupM	DupM
17	o-Xylene	0.5	ug/L	16.0	0.091	16.0	0.091	16.0	0.091	16.0	0.091	DupM	DupM	DupM
18	Acrolein	4.0	ug/L	320.0	1.832	320.0	1.832	ND(50)	0.276	ND(50)	0.276	DupM	RREL	RREL
18	Acrylonitrile	4.2	ug/L	160.0	0.916	160.0	0.916	ND(50)	0.276	ND(50)	0.276	DupM	RREL	RREL
19	Diphenyl ether	0.4	ug/L	0.4	0.003	0.4	0.003	0.4	0.003	0.4	0.003	DupM	DupM	DupM
23	1,2,4-Trichlorobenzene	10.0	ng/L	46.8	*	46.8	*	46.8	*	46.8	*	DupM	DupM	DupM
23	Hexachlorobenzene	10.0	ng/L	194.8	0.001	194.8	0.001	194.8	0.001	194.8	0.001	DupM	DupM	DupM
23	Hexachlorobutadiene	10.0	ng/L	19.5	*	19.5	*	19.5	*	19.5	*	DupM	DupM	DupM
23	Hexachloroethane	10.0	ng/L	98.5	0.001	98.5	0.001	98.5	0.001	98.5	0.001	DupM	DupM	DupM
24	Total TCDD	20.0	pg/L	37.5	*	37.5	*	37.5	*	37.5	*	DupM	DupM	DupM
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	48.3	*	48.3	*	48.3	*	48.3	*	DupM	DupM	DupM
24	Octachlorodibenzofuran	30.0	pg/L	125.5	*	125.5	*	125.5	*	125.5	*	DupM	DupM	DupM
25	Oil and grease	1.0	mg/L	1.1	6.258	1.1	6.258	1.1	6.258	1.1	6.258	DupM	DupM	DupM

* - Less than 1 gram per day

** - No additional treatment is recommended for BAT Option 3 since this wastestream flows to CO 0700 which will receive treatment with granular activated carbon and multi-media filtration for BAT Option 3.

*** - Loadings for these pollutants should be reduced based on the addition of steam stripping but cannot be predicted.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 0500 Spandex, Polymers, Powerhouse Effluent flows into CO 1100
AVERAGE FLOWRATE = 14233 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERA E		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	15	210.250	15	210.250	15	210.250	15	210.250	DupM	DupM	DupM
2	Cyanide Total	0.005	mg/L	0.018	0.263	0.018	0.263	0.018	0.263	0.018	0.263	DupM	DupM	DupM
4	Ammonia plus Ammonium	0.25	mg/L	0.19	2.551	0.19	2.551	0.19	2.551	0.19	2.551	DupM	DupM	DupM
4	Nitrate+Nitrite	0.25	mg/L	4.28	58.984	4.28	58.984	4.28	58.984	4.28	58.984	DupM	DupM	DupM
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.0	14.298	1.0	14.298	1.0	14.298	1.0	14.298	DupM	DupM	DupM
5	DOC	0.5	mg/L	4.6	60.208	4.6	60.208	4.6	60.208	4.4	62.625	DupM	DupM	Esso
5	TOC	5	mg/L	4	46.905	4	46.905	4	46.905	4	46.905	DupM	DupM	DupM
6	Total phosphorus	0.10	mg/L	0.10	1.442	0.10	1.442	0.10	1.442	0.10	1.442	DupM	DupM	DupM
8	Total suspended solids	5	mg/L	6	82.362	6	82.362	6	82.362	6	82.362	DupM	DupM	DupM
8	Volatile suspended solids	10	mg/L	5	69.750	5	69.750	5	69.750	5	69.750	DupM	DupM	DupM
9	Aluminum	30.0	ug/L	55.0	0.685	55.0	0.685	55.0	0.685	47.0	0.669	DupM	DupM	RREL
9	Boron	50.0	ug/L	57.5	0.819	57.5	0.819	57.5	0.819	57.5	0.819	DupM	DupM	DupM
9	Chromium	20.0	ug/L	20.8	0.292	20.8	0.292	20.8	0.292	20.8	0.292	DupM	DupM	DupM
9	Cobalt	20.0	ug/L	20.0	0.283	20.0	0.283	20.0	0.283	20.0	0.283	DupM	DupM	DupM
9	Copper	10.0	ug/L	20.8	0.294	20.8	0.294	20.8	0.294	20.8	0.294	DupM	DupM	DupM
9	Nickel	20.0	ug/L	10.0	0.142	10.0	0.142	10.0	0.142	10.0	0.142	DupM	DupM	DupM
9	Vanadium	30.0	ug/L	20.0	0.283	20.0	0.283	20.0	0.283	20.0	0.283	DupM	DupM	DupM
9	Zinc	10.0	ug/L	10.0	0.142	10.0	0.142	10.0	0.142	10.0	0.142	DupM	DupM	DupM
10	Antimony	5.0	ug/L	2.0	0.028	2.0	0.028	2.0	0.028	2.0	0.028	DupM	DupM	DupM
10	Arsenic	5.0	ug/L	2.0	0.028	2.0	0.028	2.0	0.028	2.0	0.028	DupM	DupM	DupM
14	Phenolics (4AAP)	2.0	ug/L	3.1	0.042	3.1	0.042	3.1	0.042	2.5	0.036	DupM	DupM	Esso
15	Sulphide	20.0	ug/L	10.0	0.139	10.0	0.139	10.0	0.139	10.0	0.139	DupM	DupM	DupM
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	26.8	0.316	26.8	0.316	26.8	0.316	26.8	0.316	DupM	DupM	DupM
16	1,1,2-Trichloroethane	0.6	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	1,1-Dichloroethane	0.8	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	1,1-Dichloroethylene	2.8	ug/L	13.4	0.158	13.4	0.158	13.4	0.158	13.4	0.158	DupM	DupM	DupM
16	1,2-Dichlorobenzene	1.4	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	1,2-Dichloroethane	0.8	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	1,2-Dichloropropane	0.9	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	1,3-Dichlorobenzene	1.1	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	1,4-Dichlorobenzene	1.7	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	Bromodichloromethane	0.8	ug/L	6.0	0.072	6.0	0.072	6.0	0.072	0.4	0.006	DupM	DupM	Esso
16	Bromoform	3.7	ug/L	53.5	0.632	53.5	0.632	53.5	0.632	53.5	0.632	DupM	DupM	DupM
16	Bromomethane	3.7	ug/L	53.5	0.632	53.5	0.632	53.5	0.632	53.5	0.632	DupM	DupM	DupM
16	Carbon tetrachloride	1.3	ug/L	6.1	0.075	6.1	0.075	6.1	0.075	6.1	0.075	DupM	DupM	DupM
16	Chlorobenzene	0.7	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	Chloroform	0.7	ug/L	7.5	0.094	7.5	0.094	7.5	0.094	1.2	0.017	DupM	DupM	Esso
16	Chloromethane	3.7	ug/L	53.5	0.632	53.5	0.632	53.5	0.632	5.0	0.071	DupM	DupM	RREL

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 0500 Spandex, Polymers, Powerhouse Effluent flows into CO 1100
AVERAGE FLOWRATE = 14233 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Cis-1,3-Dichloropropylene	1.4	ug/L	13.4	0.158	13.4	0.158	13.4	0.158	13.4	0.158	DupM	DupM	DupM
16	Dibromochloromethane	1.1	ug/L	26.8	0.316	26.8	0.316	26.8	0.316	26.8	0.316	DupM	DupM	DupM
16	Ethylene dibromide	1.0	ug/L	26.8	0.316	26.8	0.316	26.8	0.316	26.8	0.316	DupM	DupM	DupM
16	Methylene chloride	1.3	ug/L	1.2	0.018	1.2	0.018	1.2	0.018	1.2	0.018	DupM	DupM	DupM
16	Tetrachloroethylene	1.1	ug/L	15.0	0.183	15.0	0.183	15.0	0.183	2.1	0.030	DupM	DupM	Esso
16	Trans-1,2-Dichloroethylene	1.4	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	Trans-1,3-Dichloropropylene	1.4	ug/L	13.4	0.158	13.4	0.158	13.4	0.158	13.4	0.158	DupM	DupM	DupM
16	Trichloroethylene	1.9	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
16	Trichlorofluoromethane	1.0	ug/L	33.2	0.416	33.2	0.416	33.2	0.416	33.2	0.416	DupM	DupM	DupM
16	Vinyl chloride	4.0	ug/L	53.5	0.632	53.5	0.632	53.5	0.632	2.6	0.037	DupM	DupM	Esso
17	Benzene	0.5	ug/L	3.6	0.045	3.6	0.045	3.6	0.045	3.4	0.048	DupM	DupM	Esso
17	Ethylbenzene	0.6	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
17	Styrene	0.5	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
17	Toluene	0.5	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	5.4	0.063	DupM	DupM	DupM
17	m-Xylene and p-Xylene	1.1	ug/L	5.4	0.064	5.4	0.064	5.4	0.064	5.0	0.071	DupM	DupM	Esso
17	o-Xylene	0.5	ug/L	5.4	0.063	5.4	0.063	5.4	0.063	2.6	0.037	DupM	DupM	Esso
18	Acrolein	4.0	ug/L	107.0	1.264	107.0	1.264	107.0	1.264	50.0	0.712	DupM	DupM	RREL
18	Acrylonitrile	4.2	ug/L	53.5	0.632	53.5	0.632	53.5	0.632	53.5	0.632	DupM	DupM	DupM
19	Diphenyl ether	0.4	ug/L	2.1	0.031	2.1	0.031	2.1	0.031	2.1	0.031	DupM	DupM	DupM
23	1,2,4-Trichlorobenzene	10.0	ng/L	5.3	*	5.3	*	5.3	*	5.3	*	DupM	DupM	DupM
23	Hexachlorobenzene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DupM	DupM	DupM
23	Hexachlorobutadiene	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DupM	DupM	DupM
23	Hexachloroethane	10.0	ng/L	5.0	*	5.0	*	5.0	*	5.0	*	DupM	DupM	DupM
24	Total TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupM	DupM	DupM
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	50.3	*	50.3	*	50.3	*	50.3	*	DupM	DupM	DupM
24	Octachlorodibenzofuran	30.0	pg/L	30.0	*	30.0	*	30.0	*	30.0	*	DupM	DupM	DupM
25	Oil and grease	1.0	mg/L	1.3	19.127	1.3	19.127	1.3	19.127	1.3	19.127	DupM	DupM	DupM

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 0700 Cribbed Ditch flows into CO 1100
AVERAGE FLOWRATE = 53777 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	213	13266 850	213	13266.850	31	1667 087	31	1667.087	DupM	Esso	Esso
2	Cyanide Total	0.005	mg/L	0 016	0.824	0.016	0.824	0.016	0.824	0 016	0.824	DupM	DupM	DupM
4	Ammonia plus Ammonium	0.25	mg/L	0.19	10.043	0.19	10.043	0.19	10 043	0.19	10.043	DupM	DupM	DupM
4	Nitrate+Nitrite	0.25	mg/L	1.06	55.151	1 06	55.151	1.06	55 151	1.06	55.151	DupM	DupM	DupM
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.0	53.262	1.0	53.262	1.0	53 262	1.0	53.262	DupM	DupM	DupM
5	DOC	0.5	mg/L	11.3	589.187	11.3	589.187	4.4	236.619	4.4	236.619	DupM	Esso	Esso
5	TOC	5	mg/L	4	260.750	4	260.750	4	260.750	4	260.750	DupM	DupM	DupM
6	Total phosphorus	0.10	mg/L	0.10	5.572	0 10	5.572	0.10	5.572	0.10	5.572	DupM	DupM	DupM
8	Total suspended solids	5	mg/L	7	363.772	7	363.772	5	268 885	5	268.885	DupM	P1774	P1774
8	Volatile suspended solids	10	mg/L	5	283.250	5	283.250	5	268 885	5	268.885	DupM	P1774	P1774
9	Aluminum	30.0	ug/L	62.5	3.668	62.5	3.668	62.5	3.668	62.5	3.668	DupM	DupM	DupM
9	Boron	50.0	ug/L	50.0	2.832	50.0	2.832	50.0	2.832	50.0	2.832	DupM	DupM	DupM
9	Chromium	20.0	ug/L	20.0	1.133	20.0	1.133	20.0	1.133	20.0	1.133	DupM	DupM	DupM
9	Cobalt	20 0	ug/L	20.0	1.133	20.0	1.133	20.0	1.133	20.0	1.133	DupM	DupM	DupM
9	Copper	10.0	ug/L	35.0	1.937	35.0	1.937	20.0	1.133	20.0	1.133	DupM	RREL	RREL
9	Nickel	20.0	ug/L	10 0	0.566	10.0	0.566	10.0	0.566	10.0	0.566	DupM	DupM	DupM
9	Vanadium	30.0	ug/L	22.5	1.290	22 5	1.290	22.5	1.290	22.5	1.290	DupM	DupM	DupM
9	Zinc	10.0	ug/L	10.0	0.566	10.0	0.566	10.0	0.566	10.0	0.566	DupM	DupM	DupM
10	Antimony	5 0	ug/L	3.3	0.192	3.3	0.192	3.3	0.192	3.3	0.192	DupM	DupM	DupM
10	Arsenic	5.0	ug/L	2.0	0.113	2.0	0.113	2.0	0.113	2.0	0.113	DupM	DupM	DupM
14	Phenolics (4AAP)	2.0	ug/L	4.4	0.256	4.4	0.256	2.5	0.134	2.5	0.134	DupM	Esso	Esso
15	Sulphide	20.0	ug/L	10.0	0.566	10.0	0.566	10.0	0.566	10.0	0.566	DupM	DupM	DupM
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	26.8	1.667	26.8	1.667	26.8	1.667	26.8	1.667	DupM	DupM	DupM
16	1,1,2-Trichloroethane	0.6	ug/L	5.4	0.333	5 4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
16	1,1-Dichloroethane	0.8	ug/L	5.4	0.333	5.4	0.333	5.4	0 333	5.4	0.333	DupM	DupM	DupM
16	1,1-Dichloroethylene	2.8	ug/L	13.4	0.833	13.4	0.833	13.4	0.833	13.4	0.833	DupM	DupM	DupM
16	1,2-Dichlorobenzene	1.4	ug/L	5.4	0.333	5 4	0.333	5 4	0 333	5.4	0.333	DupM	DupM	DupM
16	1,2-Dichloroethane	0.8	ug/L	5.4	0.333	5 4	0.333	5.4	0 333	5.4	0.333	DupM	DupM	DupM
16	1,2-Dichloropropane	0.9	ug/L	5.4	0.333	5.4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
16	1,3-Dichlorobenzene	1.1	ug/L	5.4	0.333	5.4	0.333	5.4	0 333	5.4	0.333	DupM	DupM	DupM
16	1,4-Dichlorobenzene	1.7	ug/L	5.4	0.333	5.4	0 333	5.4	0 333	5.4	0.333	DupM	DupM	DupM
16	Bromodichloromethane	0.8	ug/L	6 5	0.399	6.5	0.399	0.4	0 022	0.4	0.022	DupM	Esso	Esso
16	Bromoform	3.7	ug/L	53.5	3 334	53 5	3 334	53 5	3 334	53 5	3.334	DupM	DupM	DupM
16	Bromomethane	3.7	ug/L	53 5	3.334	53 5	3.334	53 5	3 334	53 5	3.334	DupM	DupM	DupM
16	Carbon tetrachloride	1.3	ug/L	9.6	0 570	9.6	0.570	9.6	0 570	9 6	0.570	DupM	DupM	DupM
16	Chlorobenzene	0 7	ug/L	5.5	0 341	5 5	0.341	5.5	0.341	5 5	0.341	DupM	DupM	DupM
16	Chloroform	0 7	ug/L	9 3	0 561	9 3	0.561	1 2	0 065	1.2	0.065	DupM	Esso	Esso
16	Chloromethane	3 7	ug/L	53.5	3 334	53.5	3 334	5.0	0 269	5.0	0.269	DupM	RREL	RREL

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 0700 Cribbed Ditch flows into CO 1100
AVERAGE FLOWRATE = 53777 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Cis-1,3-Dichloropropylene	1.4	ug/L	13.4	0.833	13.4	0.833	13.4	0.833	13.4	0.833	DupM	DupM	DupM
16	Dibromochloromethane	1.1	ug/L	26.9	1.675	26.9	1.675	26.9	1.675	26.9	1.675	DupM	DupM	DupM
16	Ethylene dibromide	1.0	ug/L	26.8	1.667	26.8	1.667	26.8	1.667	26.8	1.667	DupM	DupM	DupM
16	Methylene chloride	1.3	ug/L	1.2	0.061	1.2	0.061	1.2	0.061	1.2	0.061	DupM	DupM	DupM
16	Tetrachloroethylene	1.1	ug/L	128.8	8.064	128.8	8.064	2.1	0.113	2.1	0.113	DupM	Esso	Esso
16	Trans-1,2-Dichloroethylene	1.4	ug/L	5.4	0.333	5.4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
16	Trans-1,3-Dichloropropylene	1.4	ug/L	13.4	0.833	13.4	0.833	13.4	0.833	13.4	0.833	DupM	DupM	DupM
16	Trichloroethylene	1.9	ug/L	5.4	0.333	5.4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
16	Trichlorofluoromethane	1.0	ug/L	70.4	4.221	70.4	4.221	70.4	4.221	70.4	4.221	DupM	DupM	DupM
16	Vinyl chloride	4.0	ug/L	53.5	3.334	53.5	3.334	2.6	0.140	2.6	0.140	DupM	Esso	Esso
17	Benzene	0.5	ug/L	51.2	3.218	51.2	3.218	3.4	0.183	3.4	0.183	DupM	Esso	Esso
17	Ethylbenzene	0.6	ug/L	5.4	0.333	5.4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
17	Styrene	0.5	ug/L	5.4	0.333	5.4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
17	Toluene	0.5	ug/L	5.4	0.333	5.4	0.333	5.4	0.333	5.4	0.333	DupM	DupM	DupM
17	m-Xylene and p-Xylene	1.1	ug/L	5.5	0.341	5.5	0.341	5.0	0.269	5.0	0.269	DupM	Esso	Esso
17	o-Xylene	0.5	ug/L	5.4	0.333	5.4	0.333	2.6	0.140	2.6	0.140	DupM	Esso	Esso
18	Acrolein	4.0	ug/L	107.0	6.667	107.0	6.667	50.0	2.689	50.0	2.689	DupM	RREL	RREL
18	Acrylonitrile	4.2	ug/L	53.5	3.334	53.5	3.334	53.5	3.334	53.5	3.334	DupM	DupM	DupM
19	Diphenyl ether	0.4	ug/L	5.3	0.270	5.3	0.270	5.3	0.270	5.3	0.270	DupM	DupM	DupM
23	1,2,4-Trichlorobenzene	10.0	ng/L	6.3	*	6.3	*	6.3	*	6.3	*	DupM	DupM	DupM
23	Hexachlorobenzene	10.0	ng/L	5.8	*	5.8	*	5.8	*	5.8	*	DupM	DupM	DupM
23	Hexachlorobutadiene	10.0	ng/L	6.3	*	6.3	*	6.3	*	6.3	*	DupM	DupM	DupM
23	Hexachloroethane	10.0	ng/L	10.0	0.001	10.0	0.001	10.0	0.001	10.0	0.001	DupM	DupM	DupM
24	Total TCDD	20.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	DupM	DupM	DupM
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	210.0	*	210.0	*	210.0	*	210.0	*	DupM	DupM	DupM
24	Octachlorodibenzofuran	30.0	pg/L	49.0	*	49.0	*	49.0	*	49.0	*	DupM	DupM	DupM
25	Oil and grease	1.0	mg/L	1.1	57.570	1.1	57.570	1.1	57.570	1.1	57.570	DupM	DupM	DupM

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 1100 Site Effluent to River
AVERAGE FLOWRATE = 191263 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2***	DATA SOURCE BAT 3***
1	COD	10	mg/L	61	11417.000	61	11417.000	61	11417.000	61	11417.000	DupM	DupM	DupM
2	Cyanide Total	0.005	mg/L	0.040	7.669	0.040	7.669	0.040	7.669	0.040	7.669	DupM	DupM	DupM
4	Ammonia plus Ammonium	0.25	mg/L	1.01	193.868	1.01	193.868	1.01	193.868	1.01	193.868	DupM	DupM	DupM
4	Nitrate+Nitrite	0.25	mg/L	2.70	511.600	2.70	511.600	2.70	511.600	2.70	511.600	DupM	DupM	DupM
4	Total Kjeldahl Nitrogen	0.5	mg/L	6.2	1335.407	6.2	1335.407	6.2	1335.407	6.2	1335.407	DupM	DupM	DupM
5	DOC	0.5	mg/L	6.3	1180.381	6.3	1180.381	6.3	1180.381	6.3	1180.381	DupM	DupM	DupM
5	TOC	5	mg/L	9	1848.404	9	1848.404	9	1848.404	9	1848.404	DupM	DupM	DupM
6	Total phosphorus	0.10	mg/L	0.62	128.217	0.62	128.217	0.62	128.217	0.62	128.217	DupM	DupM	DupM
8	Total suspended solids	5	mg/L	25	5356.933	25	5356.933	25	5356.933	25	5356.933	DupM	DupM	DupM
8	Volatile suspended solids	10	mg/L	17	3424.000	17	3424.000	17	3424.000	17	3424.000	DupM	DupM	DupM
9	Aluminum	30.0	ug/L	158.3	34.431	158.3	34.431	158.3	34.431	158.3	34.431	DupM	DupM	DupM
9	Boron	50.0	ug/L	55.8	10.918	55.8	10.918	55.8	10.918	55.8	10.918	DupM	DupM	DupM
9	Chromium	20.0	ug/L	21.7	4.363	21.7	4.363	21.7	4.363	21.7	4.363	DupM	DupM	DupM
9	Cobalt	20.0	ug/L	22.9	4.354	22.9	4.354	22.9	4.354	22.9	4.354	DupM	DupM	DupM
9	Copper	10.0	ug/L	93.3	18.728	93.3	18.728	93.3	18.728	20.0**	3.825	DupM	DupM	DupM
9	Nickel	20.0	ug/L	10.0	1.970	10.0	1.970	10.0	1.970	10.0	1.970	DupM	DupM	DupM
9	Vanadium	30.0	ug/L	20.0	3.940	20.0	3.940	20.0	3.940	20.0	3.940	DupM	DupM	DupM
9	Zinc	10.0	ug/L	63.3	11.803	63.3	11.803	63.3	11.803	63.3	11.803	DupM	DupM	DupM
10	Antimony	5.0	ug/L	13.5	2.689	13.5	2.689	13.5	2.689	13.5	2.689	DupM	DupM	DupM
10	Arsenic	5.0	ug/L	2.1	0.409	2.1	0.409	2.1	0.409	2.1	0.409	DupM	DupM	DupM
14	Phenolics (4AAP)	2.0	ug/L	6.1	1.142	6.1	1.142	6.1	1.142	2.5**	0.478	DupM	DupM	DupM
15	Sulphide	20.0	ug/L	10.0	1.995	10.0	1.995	10.0	1.995	10.0	1.995	DupM	DupM	DupM
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	1.3	0.259	1.3	0.259	1.3	0.259	1.3	0.259	DupM	DupM	DupM
16	1,1,2-Trichloroethane	0.6	ug/L	0.3	0.056	0.3	0.056	0.3	0.056	0.3	0.056	DupM	DupM	DupM
16	1,1-Dichloroethane	0.8	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	1,1-Dichloroethylene	2.8	ug/L	0.7	0.130	0.7	0.130	0.7	0.130	0.7	0.130	DupM	DupM	DupM
16	1,2-Dichlorobenzene	1.4	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	1,2-Dichloroethane	0.8	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	1,2-Dichloropropane	0.9	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	1,3-Dichlorobenzene	1.1	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	1,4-Dichlorobenzene	1.7	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	Bromodichloromethane	0.8	ug/L	0.8	0.153	0.8	0.153	0.8	0.153	0.8	0.153	DupM	DupM	DupM
16	Bromoform	3.7	ug/L	2.7	0.518	2.7	0.518	2.7	0.518	2.7	0.518	DupM	DupM	DupM
16	Bromomethane	3.7	ug/L	2.7	0.518	2.7	0.518	2.7	0.518	2.7	0.518	DupM	DupM	DupM
16	Carbon tetrachloride	1.3	ug/L	1.0	0.190	1.0	0.190	1.0	0.190	1.0	0.190	DupM	DupM	DupM
16	Chlorobenzene	0.7	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	Chloroform	0.7	ug/L	2.1	0.407	2.1	0.407	2.1	0.407	2.1	0.407	DupM	DupM	DupM
16	Chloromethane	3.7	ug/L	2.7	0.518	2.7	0.518	2.7	0.518	2.7	0.518	DupM	DupM	DupM

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - MAITLAND

CONTROL POINT - CO 1100 Site Effluent to River
AVERAGE FLOWRATE = 191263 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2***	BAT 3***
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.7	0.130	0.7	0.130	0.7	0.130	0.7	0.130	DupM	DupM	DupM
16	Dibromochloromethane	1.1	ug/L	1.3	0.259	1.3	0.259	1.3	0.259	1.3	0.259	DupM	DupM	DupM
16	Ethylene dibromide	1.0	ug/L	1.3	0.259	1.3	0.259	1.3	0.259	1.3	0.259	DupM	DupM	DupM
16	Methylene chloride	1.3	ug/L	0.8	0.153	0.8	0.153	0.8	0.153	0.8	0.153	DupM	DupM	DupM
16	Tetrachloroethylene	1.1	ug/L	18.4	3.641	18.4	3.641	18.4	3.641	2.1**	0.402	DupM	DupM	Esso
16	Trans-1,2-Dichloroethylene	1.4	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
16	Trans-1,3-Dichloropropylene	1.4	ug/L	0.7	0.130	0.7	0.130	0.7	0.130	0.7	0.130	DupM	DupM	DupM
16	Trichloroethylene	1.9	ug/L	2.0	0.420	2.0	0.420	2.0	0.420	2.0	0.420	DupM	DupM	DupM
16	Trichlorofluoromethane	1.0	ug/L	16.3	2.910	16.3	2.910	16.3	2.910	16.3	2.910	DupM	DupM	DupM
16	Vinyl chloride	4.0	ug/L	2.7	0.518	2.7	0.518	2.7	0.518	2.7	0.518	DupM	DupM	DupM
17	Benzene	0.5	ug/L	0.7	0.128	0.7	0.128	0.7	0.128	0.7	0.128	DupM	DupM	DupM
17	Ethylbenzene	0.6	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
17	Styrene	0.5	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
17	Toluene	0.5	ug/L	0.5	0.086	0.5	0.086	0.5	0.086	0.5	0.086	DupM	DupM	DupM
17	m-Xylene and p-Xylene	1.1	ug/L	0.4	0.069	0.4	0.069	0.4	0.069	0.4	0.069	DupM	DupM	DupM
17	o-Xylene	0.5	ug/L	0.3	0.052	0.3	0.052	0.3	0.052	0.3	0.052	DupM	DupM	DupM
18	Acrolein	4.0	ug/L	8.0	1.542	8.0	1.542	8.0	1.542	8.0	1.542	DupM	DupM	DupM
18	Acrylonitrile	4.2	ug/L	4.0	0.771	4.0	0.771	4.0	0.771	4.0	0.771	DupM	DupM	DupM
19	Diphenyl ether	0.4	ug/L	0.5	0.089	0.5	0.089	0.5	0.089	0.5	0.089	DupM	DupM	DupM
23	1,2,4-Trichlorobenzene	10.0	ng/L	6.3	0.001	6.3	0.001	6.3	0.001	6.3	0.001	DupM	DupM	DupM
23	Hexachlorobenzene	10.0	ng/L	6.1	0.001	6.1	0.001	6.1	0.001	6.1	0.001	DupM	DupM	DupM
23	Hexachlorobutadiene	10.0	ng/L	5.6	0.001	5.6	0.001	5.6	0.001	5.6	0.001	DupM	DupM	DupM
23	Hexachloroethane	10.0	ng/L	12.6	0.002	12.6	0.002	12.6	0.002	12.6	0.002	DupM	DupM	DupM
24	Total TCDD	20.0	pg/L	665.0	*	665.0	*	665.0	*	665.0	*	DupM	DupM	DupM
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	97.5	*	97.5	*	97.5	*	97.5	*	DupM	DupM	DupM
24	Octachlorodibenzofuran	30.0	pg/L	42.5	*	42.5	*	42.5	*	42.5	*	DupM	DupM	DupM
25	Oil and grease	1.0	mg/L	2.5	530.980	2.5	530.980	2.5	530.980	2.5	530.980	DupM	DupM	DupM

* - Less than 1 gram per day

** - BAT Option 3 loading based on reduction at CO 0400 and CO 0700

*** - Except as noted, BAT Option 3 loading not shown as reduced for many pollutants but should be based on steam stripping, granular activated carbon and multi-media filtration installed at PR 0300, CO 0400, CO 0500 and CO 0700.

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

DU PONT CANADA INC. - WHITBY SITE

1.0 PLANT DESCRIPTION

The Du Pont Canada Inc. plant is located in Whitby, several kilometers north of Lake Ontario. The plant began operations about 1955. Initially, the plant manufactured polyethylene film. Nylon film and Vexar™ netting manufacture were added in 1966 and 1971, respectively. The plant has approximately 280 employees. Most of the plant operates 365 days a year, 24 hours a day, with two 12-hour shifts. The Vexar™ Process only operates five days a week.

The plant processes include the following:

- Polyethylene extrusion process/film blowing
- Polyethylene reclaim
- Nylon casting process
- Vexar™ extrusion process

The products include film used to package products such as milk, bacon and cheese (nylon film) and rope, netting, and fencing (Vexar™). The nylon and polyethylene products are clear, or pigmented white, while the Vexar™ products are made in a variety of colours.

Municipal water is used as once through non-contact cooling water. This water is discharged through a ditch to a creek running north on the east side of the plant. Other than a series of coarse stone dikes and screens across the ditch to entrain resin pellets, there is no wastewater treatment system at the Du Pont Whitby site.

Du Pont is currently studying the feasibility of eliminating the discharge from the Vexar process by incorporating a cooling tower. The cooling tower blowdown would be discharged to the sanitary sewer. Du Pont also plans to redirect the boiler blowdown and steam cabinet blowdown in the Nylon area to the sanitary sewer. These two projects would eliminate contact cooling water at the site.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Most plant drains which are directly discharged into the effluent ditch have rubber seals over them to prevent particulate matter from falling into the drains. Floor drains in the plant are directed to storm sewers and to the effluent ditch. However, all of the floor drains in the plant are either sealed permanently, filled with concrete or capped (may be removed if required), or have collars. All of the equipment in the Vexar™ area has drainage trenches underneath. The wastewater in these trenches is screened and directed to the effluent ditch. Table 1.0 presents the sources of wastewater generated at the site.

TABLE 1.0
SOURCES OF WASTEWATER DIRECTLY DISCHARGED TO THE EFFLUENT DITCH

SOURCE(S)	UNIT PROCESS
Roof drain runoff	NA[1]
Stormwater runoff	NA
Extruder Hopper cooling Float exchanger cooling Clutch cooling Barrel heat exchanger	Polyethylene blown film extrusion process
Drive heat exchanger Clutch cooling Barrel heat exchanger Hopper cooling Cooler heat exchanger/Pellet cooling	Polyethylene reclaim process
Drive heat exchanger Barrel heat exchanger Casting heat exchanger Transfer line heat exchanger Steam cabinet	Nylon casting process
Drive cooling Overflow bath Orienting bath	Vexar™ extrusion process
Boiler Blowdown	Nylon casting process
Condensate from Vacuum pumps	Nylon casting process

NOTES: 1 - NA = Not applicable

There are five different direct discharges to a creek (which in turn discharges to Lake Ontario) which were monitored under the MISA monitoring program. Table 2.0 presents each of these MISA Control Points along with a brief description.

TABLE 2.0 MISA CONTROL POINTS	
MISA CONTROL POINT	DESCRIPTION
CO 0200	Nylon line combined effluent to River
OT 0300	Nylon line once-through cooling water
OT 0400	Polyethylene extrusion south water to River
OT 0500	Reclaim Unit #2 water
OT 0600	Extrusion north water to River

2.2 WASTEWATER FLOW AND QUALITY

The tables in Appendix A of this report present the draft analytical data from all five MISA Control Points as obtained from the MISA twelve month monitoring period; the plant was not sampled during the first six months of monitoring and therefore, was not included in the MISA OCM Sector Six Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed that the effluent from MISA Control Point CO 0200 was consistently lethal to Rainbow Trout and Daphnia Magna. A review of the analytical results did not reveal any possible causes of the toxicity; most of the contaminants were present at very low concentrations. Therefore, a Toxicity Investigation Evaluation (TIE) study is recommended before an assessment can be made as to which technologies can be implemented to reduce the toxicity at MISA Control Point CO 0200. No toxicity data were available from the other direct discharges of the plant. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 2).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies found at similar U.S. or OCM Sector plants that, if installed, will achieve the maximum overall pollutant reduction. Draft analytical results obtained from the MISA OCM Sector Twelve Month Report indicate current pollutant discharge levels are as low or lower than discharge levels at similar U.S. plants and Ontario plants; therefore, no additional treatment is recommended for BAT Option 2 at MISA Control Points OT 0300, OT 0400, OT 0500 and CO 0200.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that will advance the plant furthest towards virtual elimination and the ultimate goal of zero discharge of contaminants and consists of any current technology or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors. Based on the analytical results of the monitored parameters at the other direct discharges, no additional treatment is recommended for BAT Option 3 at MISA Control Points OT 0300, OT 0400, OT 0500, OT 0600 and CO 0200.

3.4 SUMMARY OF BAT OPTIONS

Table 3.0 presents a summary of the BAT options recommended for this plant.

TABLE 3.0 SUMMARY OF BAT OPTIONS FOR DU PONT CANADA LTD - WHITBY SITE		
BAT OPTION	**DEFINITIONS**	**DESCRIPTION**
1	Non-lethal effluent	CO 0200: TIE
2	U.S./Ontario BAT/ Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Same as BAT Option 2

4.0 BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

Table 4.0 presents the cost estimates for the technologies considered under the BAT Options for the Du Pont Canada Inc. Whitby Plant. Cost estimates for development and implementation of a TIE study could not be developed due to the site-specific nature of the study.

6.0 REFERENCES

1. Du Pont Canada Inc. - Whitby - BAT status of the OCM Sector Plants Site Visit Information Report, March 1, 1991.

2. Technical Support Document for Water Quality-based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluation" EPA 505/2-90-001, March 1991.

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fiber Point Source Category (EPA 440/1-87/009, October 1987).

TABLE 4.0
BAT OPTION MODELS COST ESTIMATES
DU PONT CANADA Inc. - WHITBY SITE

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
CO 0200	804	NA	NA	TIE	0	0	NAT	0	0	NAT
OT 0300	75	0	0	NAT	0	0	NAT	0	0	NAT
OT 0400	390	0	0	NAT	0	0	NAT	0	0	NAT
OT 0500	564	0	0	NAT	0	0	NAT	0	0	NAT
OT 0600	1,631	0	0	NAT	0	0	NAT	0	0	NAT

NOTES:

NA - Cost estimates not developed
NAT - No additional treatment
TIE - Toxicity Investigation Evaluation

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR DU PONT CANADA Inc. - WHITBY

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – DU PONT CANADA INC. – WHITBY

ATG	PARAMETER	RMDL	UNIT	IN 0900	CO 0200	OT 0300	OT 0400	OT 0500	OT 0600
1	COD	10	mg/L	–	13	–	–	–	–
2	Cyanide Total	0.005	mg/L	–	0.005	–	–	–	–
3	Hydrogen ion (pH)			8.1	7.9	7.8	7.9	7.9	8.0
4	Ammonia plus Ammonium	0.25	mg/L	–	0.11	–	–	–	–
4	Nitrate+Nitrite	0.25	mg/L	–	0.40	–	–	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	0.3	–	–	–	–
5	DOC	0.5	mg/L	1.7	3.5	1.7	1.7	1.7	2.0
5	TOC	5	mg/L	2	4	2	2	2	2
6	Total phosphorus	0.10	mg/L	0.10	0.10	0.10	0.10	0.10	0.10
7	Specific conductance	5	uS/cm	314	323	340	352	387	348
8	Total suspended solids	5	mg/L	4	3	2	2	4	8
8	Volatile suspended solids	10	mg/L	5	4	–	–	–	–
9	Aluminum	30.0	ug/L	65.8	100.0	68.3	83.3	85.0	131.7
9	Copper	10.0	ug/L	10.0	10.0	17.5	10.0	10.8	11.7
9	Zinc	10.0	ug/L	13.3	10.0	10.8	10.0	10.0	10.0
14	Phenolics (4AAP)	2.0	ug/L	1.0	4.6	1.2	1.1	1.1	1.2
16	Bromodichloromethane	0.8	ug/L	–	2.5	–	–	–	–
16	Chloroform	0.7	ug/L	–	2.3	–	–	–	–
16	Dibromochloromethane	1.1	ug/L	–	1.7	–	–	–	–
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	–	5.5	–	–	–	–
19	Di–n–octyl phthalate	2.0	ug/L	–	2.3	–	–	–	–
19	Diphenyl ether	0.4	ug/L	–	0.5	–	–	–	–
19	Fluoranthene	0.4	ug/L	–	2.2	–	–	–	–
25	Oil and grease	1.0	mg/L	1.1	1.3	2.2	1.1	1.1	1.1
98	Ftflow		m3/day	–	654	54	295	426	1373

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0900 – Intake Water to Site
CO 0200 – Nylon Line Combined Effluent to River
OT 0300 – Nylon Line Cooling Water to River
OT 0400 – Polyethylene Extrusion Water South to River
OT 0500 – Reclaim Unit #2 Water to River
OT 0600 – Polyethylene Extrusion Water North to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – DU PONT CANADA INC. – WHITBY

ATG	PARAMETER	IN 0900	CO 0200	OT 0300	OT 0400	OT 0500	OT 0600	TOTAL
1	COD	–	8.856	–	–	–	–	8.856
2	Cyanide Total	–	0.003	–	–	–	–	0.003
4	Ammonia plus Ammonium	–	0.059	–	–	–	–	0.059
4	Nitrate+Nitrite	–	0.228	–	–	–	–	0.228
4	Total Kjeldahl Nitrogen	–	0.124	–	–	–	–	0.124
5	DOC	4.881	2.275	0.096	0.501	0.713	2.693	6.278
5	TOC	5.239	2.642	0.122	0.619	0.806	2.785	6.974
6	Total phosphorus	0.280	0.071	0.005	0.029	0.043	0.137	0.285
8	Total suspended solids	10.190	1.905	0.152	0.845	1.423	11.623	15.948
8	Volatile suspended solids	14.009	1.653	–	–	–	–	1.653
9	Aluminum	0.184	0.068	0.004	0.025	0.035	0.180	0.312
9	Copper	0.028	0.007	0.001	0.003	0.005	0.017	0.033
9	Zinc	0.037	0.007	0.001	0.003	0.004	0.014	0.029
14	Phenolics (4AAP)	0.003	0.003	*	*	*	0.001	0.004
16	Bromodichloromethane	–	0.001	–	–	–	–	0.001
16	Chloroform	–	0.001	–	–	–	–	0.001
16	Dibromochloromethane	–	0.001	–	–	–	–	0.001
19	Bis(2–ethylhexyl) phthalate	–	0.005	–	–	–	–	0.005
19	Di–n–octyl phthalate	–	0.001	–	–	–	–	0.001
19	Diphenyl ether	–	*	–	–	–	–	*
19	Fluoranthene	–	0.002	–	–	–	–	0.002
25	Oil and grease	3.057	0.890	0.109	0.325	0.468	1.487	3.279

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS
IN 0900 – Intake Water to Site
CO 0200 – Nylon Line Combined Effluent to River
OT 0300 – Nylon Line Cooling Water to River
OT 0400 – Polyethylene Extrusion Water South to River
OT 0500 – Reclaim Unit #2 Water to River
OT 0600 – Polyethylene Extrusion Water North to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
DU PONT CANADA Inc. - WHITBY

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - WHITBY

CO 0200 - Nylon Line Combined Effluent to River
AVERAGE FLOWRATE = 654 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	13	8.856	13	8.856	13	8.856	13	8.856	DupW	DupW	DupW
2	Cyanide Total	0.005	mg/L	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	DupW	DupW	DupW
4	Ammonia plus Ammonium	0.25	mg/L	0.11	0.059	0.11	0.059	0.11	0.059	0.11	0.059	DupW	DupW	DupW
4	Nitrate+Nitrite	0.25	mg/L	0.40	0.228	0.40	0.228	0.40	0.228	0.40	0.228	DupW	DupW	DupW
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	0.124	0.3	0.124	0.3	0.124	0.3	0.124	DupW	DupW	DupW
5	DOC	0.5	mg/L	3.5	2.275	3.5	2.275	3.5	2.275	3.5	2.275	DupW	DupW	DupW
5	TOC	5	mg/L	4	2.642	4	2.642	4	2.642	4	2.642	DupW	DupW	DupW
6	Total phosphorus	0.10	mg/L	0.10	0.071	0.10	0.071	0.10	0.071	0.10	0.071	DupW	DupW	DupW
8	Total suspended solids	5	mg/L	3	1.905	3	1.905	3	1.905	3	1.905	DupW	DupW	DupW
8	Volatile suspended solids	10	mg/L	4	1.653	4	1.653	4	1.653	4	1.653	DupW	DupW	DupW
9	Aluminum	30.0	ug/L	100.0	0.068	100.0	0.068	100.0	0.068	100.0	0.068	DupW	DupW	DupW
9	Copper	10.0	ug/L	10.0	0.007	10.0	0.007	10.0	0.007	10.0	0.007	DupW	DupW	DupW
9	Zinc	10.0	ug/L	10.0	0.007	10.0	0.007	10.0	0.007	10.0	0.007	DupW	DupW	DupW
14	Phenolics (4AAP)	2.0	ug/L	4.6	0.003	4.6	0.003	4.6	0.003	4.6	0.003	DupW	DupW	DupW
16	Bromodichloromethane	0.8	ug/L	2.5	0.001	2.5	0.001	2.5	0.001	2.5	0.001	DupW	DupW	DupW
16	Chloroform	0.7	ug/L	2.3	0.001	2.3	0.001	2.3	0.001	2.3	0.001	DupW	DupW	DupW
16	Dibromochloromethane	1.1	ug/L	1.7	0.001	1.7	0.001	1.7	0.001	1.7	0.001	DupW	DupW	DupW
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	5.5	0.005	5.5	0.005	5.5	0.005	5.5	0.005	DupW	DupW	DupW
19	Di-n-octyl phthalate	2.0	ug/L	2.3	0.001	2.3	0.001	2.3	0.001	2.3	0.001	DupW	DupW	DupW
19	Diphenyl ether	0.4	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	DupW	DupW	DupW
19	Fluoranthene	0.4	ug/L	2.2	0.002	2.2	0.002	2.2	0.002	2.2	0.002	DupW	DupW	DupW
25	Oil and grease	1.0	mg/L	1.3	0.890	1.3	0.890	1.3	0.890	1.3	0.890	DupW	DupW	DupW

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - WHITBY

OT 0300 - Nylon Line Cooling Water to River
AVERAGE FLOWRATE = 54 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV' RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	1.7	0.096	1.7	0.096	1.7	0.096	1.7	0.096	DupW	DupW	DupW
5	TOC	5	mg/L	2	0.122	2	0.122	2	0.122	2	0.122	DupW	DupW	DupW
6	Total phosphorus	0.10	mg/L	0.10	0.005	0.10	0.005	0.10	0.005	0.10	0.005	DupW	DupW	DupW
8	Total suspended solids	5	mg/L	2	0.152	2	0.152	2	0.152	2	0.152	DupW	DupW	DupW
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	68.3	0.004	68.3	0.004	68.3	0.004	68.3	0.004	DupW	DupW	DupW
9	Copper	10.0	ug/L	17.5	0.001	17.5	0.001	17.5	0.001	17.5	0.001	DupW	DupW	DupW
9	Zinc	10.0	ug/L	10.8	0.001	10.8	0.001	10.8	0.001	10.8	0.001	DupW	DupW	DupW
14	Phenolics (4AAP)	2.0	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	DupW	DupW	DupW
16	Bromodichloromethane	0.8	ug/L	-	-	-	-	-	-	-	-			
16	Chloroform	0.7	ug/L	-	-	-	-	-	-	-	-			
16	Dibromochloromethane	1.1	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Di-n-octyl phthalate	2.0	ug/L	-	-	-	-	-	-	-	-			
19	Diphenyl ether	0.4	ug/L	-	-	-	-	-	-	-	-			
19	Fluoranthene	0.4	ug/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	2.2	0.109	2.2	0.109	2.2	0.109	2.2	0.109	DupW	DupW	DupW

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - WHITBY

CONTROL POINT - OT 0400 Polyethylene Extrusion Water South to River
AVERAGE FLOWRATE = 295 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV' RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	1.7	0.501	1.7	0.501	1.7	0.501	1.7	0.501	DupW	DupW	DupW
5	TOC	5	mg/L	2	0.619	2	0.619	2	0.619	2	0.619	DupW	DupW	DupW
6	Total phosphorus	0.10	mg/L	0.10	0.029	0.10	0.029	0.10	0.029	0.10	0.029	DupW	DupW	DupW
8	Total suspended solids	5	mg/L	2	0.845	2	0.845	2	0.845	2	0.845	DupW	DupW	DupW
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	83.3	0.025	83.3	0.025	83.3	0.025	83.3	0.025	DupW	DupW	DupW
9	Copper	10.0	ug/L	10.0	0.003	10.0	0.003	10.0	0.003	10.0	0.003	DupW	DupW	DupW
9	Zinc	10.0	ug/L	10.0	0.003	10.0	0.003	10.0	0.003	10.0	0.003	DupW	DupW	DupW
14	Phenolics (4AAP)	2.0	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	DupW	DupW	DupW
16	Bromodichloromethane	0.8	ug/L	-	-	-	-	-	-	-	-			
16	Chloroform	0.7	ug/L	-	-	-	-	-	-	-	-			
16	Dibromochloromethane	1.1	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Di-n-octyl phthalate	2.0	ug/L	-	-	-	-	-	-	-	-			
19	Diphenyl ether	0.4	ug/L	-	-	-	-	-	-	-	-			
19	Fluoranthene	0.4	ug/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	1.1	0.325	1.1	0.325	1.1	0.325	1.1	0.325	DupW	DupW	DupW

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - WHITBY

CONTROL POINT - OT 0500 Reclaim Unit #2 Water to River
AVERAGE FLOWRATE = 426 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0 25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	1.7	0.713	1.7	0.713	1.7	0.713	1.7	0.713	DupW	DupW	DupW
5	TOC	5	mg/L	2	0.806	2	0.806	2	0.806	2	0.806	DupW	DupW	DupW
6	Total phosphorus	0.10	mg/L	0.10	0.043	0.10	0.043	0.10	0.043	0.10	0.043	DupW	DupW	DupW
8	Total suspended solids	5	mg/L	4	1.423	4	1.423	4	1.423	4	1.423	DupW	DupW	DupW
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	85.0	0.035	85.0	0.035	85 0	0.035	85.0	0.035	DupW	DupW	DupW
9	Copper	10.0	ug/L	10.8	0 005	10.8	0.005	10.8	0.005	10.8	0.005	DupW	DupW	DupW
9	Zinc	10.0	ug/L	10.0	0.004	10.0	0.004	10.0	0.004	10.0	0.004	DupW	DupW	DupW
14	Phenolics (4AAP)	2.0	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	DupW	DupW	DupW
16	Bromodichloromethane	0.8	ug/L	-	-	-	-	-	-	-	-			
16	Chloroform	0.7	ug/L	-	-	-	-	-	-	-	-			
16	Dibromochloromethane	1.1	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Di-n-octyl phthalate	2.0	ug/L	-	-	-	-	-	-	-	-			
19	Diphenyl ether	0.4	ug/L	-	-	-	-	-	-	-	-			
19	Fluoranthene	0.4	ug/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	1.1	0.468	1.1	0.468	1.1	0.468	1.1	0.468	DupW	DupW	DupW

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - DU PONT CANADA INC. - WHITBY

CONTROL POINT - OT 0600 Polyethylene Extrusion Water North to River
AVERAGE FLOWRATE = 1373 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	2.0	2.693	2.0	2.693	2.0	2.693	2.0	2.693	DupW	DupW	DupW
5	TOC	5	mg/L	2	2.785	2	2.785	2	2.785	2	2.785	DupW	DupW	DupW
6	Total phosphorus	0.10	mg/L	0.10	0.137	0.10	0.137	0.10	0.137	0.10	0.137	DupW	DupW	DupW
8	Total suspended solids	5	mg/L	8	11.623	8	11.623	8	11.623	8	11.623	DupW	DupW	DupW
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	131.7	0.180	131.7	0.180	131.7	0.180	131.7	0.180	DupW	DupW	DupW
9	Copper	10.0	ug/L	11.7	0.017	11.7	0.017	11.7	0.017	11.7	0.017	DupW	DupW	DupW
9	Zinc	10.0	ug/L	10.0	0.014	10.0	0.014	10.0	0.014	10.0	0.014	DupW	DupW	DupW
14	Phenolics (4AAP)	2.0	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	DupW	DupW	DupW
16	Bromodichloromethane	0.8	ug/L	-	-	-	-	-	-	-	-			
16	Chloroform	0.7	ug/L	-	-	-	-	-	-	-	-			
16	Dibromochloromethane	1.1	ug/L	-	-	-	-	-	-	-	-			
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
19	Di-n-octyl phthalate	2.0	ug/L	-	-	-	-	-	-	-	-			
19	Diphenyl ether	0.4	ug/L	-	-	-	-	-	-	-	-			
19	Fluoranthene	0.4	ug/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	1.1	1.487	1.1	1.487	1.1	1.487	1.1	1.487	DupW	DupW	DupW

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

ESSO CHEMICAL CANADA

1.0 PLANT DESCRIPTION

The Esso Chemical Canada facility is located in Sarnia, between Vidal and Scott Roads. Currently, the Esso Chemical complex includes the Polyvinyl Chloride Resin Manufacturing Plant (PVC), the Polyethylene Resin Manufacturing Plant (SPEP), and the Aromatics Plant (ARIS).

Operations at the Esso Sarnia Chemical Plant (SCP) began in 1957 as part of the Imperial Oil Ltd. complex located along the St. Clair River in Sarnia's Chemical Valley.

Polyvinyl chloride resin formulations are used in the manufacture of clothing, automobile trim, piping, wire insulation, window frames, swimming pool liners and house siding. Polyethylene is used for consumer packaging, cable insulation, piping and tiles. Aromatics are produced from feedstock supplied by the refinery; benzene, toluene, and xylenes are the final products from the ARIS Plant.

The Sarnia Chemical Plant has separate sewer systems for oily and clean waters. The clean water sewer receives PVC plant process water, polyethylene contact water, cooling tower blowdown and stormwater. Contaminated or potentially contaminated water is passed through oil separators to the oily water impounding basin. The discharge is pumped through dual media sand-anthracite and carbon adsorption filters to the clean water impounding basin (MISA Control Point PR 0200). The clean water basin discharge is pumped to the St. Clair River (MISA Control Point CO 0300).

Details on the plant processes, water uses, and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

During the MISA six and twelve month monitoring period, data were collected on the treated oily water (carbon contactor effluent) MISA Control Point PR 0200 and the combined effluent to the river (MISA Control Point CO 0300).

The Esso SCP has separate sewer systems to handle sanitary waste, concentrated chemicals, potentially contaminated wastewater, clean wastewater, potentially contaminated surface water runoff and non-contaminated surface water runoff. The sanitary sewer system is tied into the City of Sarnia Sanitary Treatment Facility. Stormwater runoff from non-developed areas runs into existing surface drainage systems. The balance of the sewer systems are managed on-site.

Concentrated chemicals are collected in separate facilities for subsequent recycle and recovery. This minimizes contamination of other sewer systems. The oily water sewer system collects all water, including precipitation, that has a high potential for contamination. The clean wastewater sewer system collects all other wastewater, including precipitation, cooling water and process wastewater which has a low potential for being contaminated.

Contaminated and potentially contaminated wastewater from the oily wastewater sewer system is processed through oil/solids separators to the oily wastewater retention basin. Wastewater from the oily wastewater retention basin is pumped to dual media (sand-anthracite) filters and an activated carbon adsorption filter. The treated water from these filters (MISA Control Point PR 0200) is discharged to a clean water impounding basin. Water from the clean water sewer system is also pumped into the clean water impounding basin. The combined water from this impounding basin is pumped to the St. Clair River (MISA Control Point CO 0300).

Table 1.0 presents a summary of wastewater including cooling water and stormwater runoff to the oily and clean water sewer system.

TABLE 1.0 SOURCES OF WASTEWATER AND THEIR DESTINATION		
SOURCE OF WASTEWATER	TYPE OF WASTEWATER	DESTINATION
NE Tank Lot	Stormwater	Oily wastewater sewer
CVU Unit	Stormwater	Oily wastewater sewer
ARIS Unit	Process	Oily wastewater sewer
SPEP Unit (Polyethylene Plant)	Process	Oily wastewater sewer
Guarded Plant	Cooling Water	Oily and clean wastewater sewer
Flare Stack	Process	Oily wastewater sewer
CPCU SE Tank Lot	Stormwater	Oily wastewater sewer
Loading Racks Sumps Overflow	Stormwater	Oily wastewater sewer
Cooling Tower Blowdown	Cooling Water	Clean wastewater sewer
SPEP Unit	Process	Clean wastewater sewer
SW Tank Lot	Stormwater	Clean wastewater sewer
PVC Unit	Process	Clean wastewater sewer
Guarded Plant	Stormwater	Oily wastewater sewer

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results for MISA Control Points PR 0200 and CO 0300 as obtained for the MISA OCM Sector Twelve Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will

advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled, and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period at MISA Control Point CO 0300 indicated that the plant's only direct discharge was acutely lethal to Daphnia Magna on one occasion. Toxicity data were not required from MISA Control Point PR 0200.

A review of the matching analytical chemistry data collected during the MISA Twelve Month Monitoring Period for the MISA Control Point CO 0300 on the day the effluent was found to be acutely lethal did not reveal any probable causes of the observed acute toxicity. Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Point CO 0300 to assess the toxicity problem identified. A series of guidance documents for conducting Toxicity Reduction Evaluation (TREs) are available from the U.S. EPA (Ref. 2).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction. The analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 0200 and CO 0300 indicate that the plant's current pollutant discharge levels are as low or lower than discharge levels at similar organic chemical manufacturing plants in the U.S. and Ontario. Therefore, no additional treatment is recommended for BAT Option 2.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge. For this option, technologies were not identified beyond those currently employed at the plant for MISA Control Point PR 0200. However, the draft analytical results of the MISA Twelve Month Monitoring Period at MISA Control Point CO 0300 showed relatively elevated concentrations of some contaminants. It is clear from the monitoring results that the

granular activated carbon/multimedia filtration system applied to MISA Control Point PR 0200 should be able to provide additional pollution reduction for MISA Monitoring Point CO 0300 and therefore is recommended for BAT Option 3 for MISA Control Point CO 0300.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of BAT Options recommended for Esso Chemical Canada.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR ESSO CHEMICAL CANADA

BAT OPTION	DEFINITION	DESCRIPTION
MISA CONTROL POINT PR 0200		
1	Non-lethal effluent	Not tested for toxicity
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
MISA CONTROL POINT CO 0300		
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Granular Activated Carbon Multimedia Filtration

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars

and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow, as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for the Esso Chemical Canada were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 3).

Table 3.0 presents the cost estimates for the technologies considered for each BAT Option for the Esso Chemical Plant. The only cost estimate is for granular activated carbon and multimedia filtration at MISA Control Point CO 0300 for BAT Option 3. Cost estimates for development and implementation of a TIE plan could not be developed due to the site specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES[1]
ESSO CHEMICALS CANADA

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 3 CAPITAL	BAT OPTION 3 O&M	BAT OPTION 3 TECHNOLOGY
PR 0200	3,376	0	0	---
CO 0300	32,560	30,056,500 2,692,500 32,749,000	3,291,500 157,600 3,449,100	Granular Activated Carbon Multimedia Filtration Total

NOTES:

(1) There is no cost associated with BAT Options 1 and 2

6.0 REFERENCES

1. Esso Chemicals Canada. BAT Status of the OCM Sector Plants Site Visit Information Report, April 18, 1991.

2. J.S. Shrives, Oil and Gas & Energy, Division of Industrial Program Branch, Environmental Protection, Environment Canada, May 1987 "Best Management Practices (BMP's) and their application to Ontario's MISA Program"

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987)

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR ESSO CHEMICALS CANADA

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – ESSO CHEMICAL CANADA – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 0100	PR 0200	CO 0300
1	COD	10	mg/L	8	31	30
2	Cyanide Total	0.005	mg/L	0.005	0.014	0.011
3	Hydrogen ion (pH)			8.1	7.8	8.2
4	Ammonia plus Ammonium	0.25	mg/L	0.10	0.10	0.10
4	Nitrate+Nitrite	0.25	mg/L	0.30	0.35	0.22
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	0.3	0.2
5	DOC	0.5	mg/L	2.4	4.4	6.7
5	TOC	5	mg/L	3	5	7
6	Total phosphorus	0.10	mg/L	0.02	0.03	0.03
7	Specific conductance	5	uS/cm	174	276	219
8	Total suspended solids	5	mg/L	8	6	6
8	Volatile suspended solids	10	mg/L	4	3	6
9	Aluminum	30.0	ug/L	127.5	74.2	56.7
9	Copper	10.0	ug/L	14.8	19.7	23.3
9	Zinc	10.0	ug/L	7.3	19.3	23.2
14	Phenolics (4AAP)	2.0	ug/L	2.3	2.5	2.2
16	Bromodichloromethane	0.8	ug/L	0.2	0.4	0.9
16	Chloroform	0.7	ug/L	0.2	1.2	3.0
16	Tetrachloroethylene	1.1	ug/L	0.5	2.1	0.5
16	Vinyl chloride	4.0	ug/L	1.3	2.6	7.7
17	Benzene	0.5	ug/L	0.2	3.4	4.7
17	Toluene	0.5	ug/L	0.3	5.4	4.9
17	m–Xylene and p–Xylene	1.1	ug/L	0.2	5.0	4.5
17	o–Xylene	0.5	ug/L	0.2	2.6	2.3
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	6.1	5.9	5.2
23	Hexachlorobutadiene	10.0	ng/L	5.0	217.3	55.3
23	Hexachloroethane	10.0	ng/L	5.0	72.8	16.0
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	56.7	35.0	30.0
24	Octachlorodibenzofuran	30.0	pg/L	33.3	30.0	30.0
25	Oil and grease	1.0	mg/L	1.2	1.3	1.3
98	Ftflow		m3/day	25174	2549	28941

EXPLANATORY NOTES:

(i) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(ii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS:

IN 0100 – Intake Water to Site
PR 0200 – Carbon Contactor Effluent flows into CO 0300
CO 0300 – Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – ESSO CHEMICAL CANADA – SARNIA

ATG	PARAMETER	IN 0100	PR 0200	CO 0300	TOTAL
1	COD	199.753	77.006	771.361	771.361
2	Cyanide Total	0.128	0.030	0.277	0.277
4	Ammonia plus Ammonium	2.552	0.266	2.552	2.552
4	Nitrate+Nitrite	7.762	0.925	5.754	5.754
4	Total Kjeldahl Nitrogen	5.296	0.762	6.034	6.034
5	DOC	68.368	11.452	191.832	191.832
5	TOC	78.996	12.233	206.286	206.286
6	Total phosphorus	0.643	0.079	0.718	0.718
8	Total suspended solids	237.376	17.041	181.103	181.103
8	Volatile suspended solids	93.343	7.884	164.057	164.057
9	Aluminum	3.520	0.166	1.560	1.560
9	Copper	0.434	0.049	0.681	0.681
9	Zinc	0.211	0.049	0.685	0.685
14	Phenolics (4AAP)	0.067	0.007	0.062	0.062
16	Bromodichloromethane	0.006	0.001	0.025	0.025
16	Chloroform	0.006	0.003	0.081	0.081
16	Tetrachloroethylene	0.014	0.006	0.014	0.014
16	Vinyl chloride	0.039	0.011	0.202	0.202
17	Benzene	0.006	0.011	0.135	0.135
17	Toluene	0.008	0.018	0.145	0.145
17	m–Xylene and p–Xylene	0.006	0.017	0.129	0.129
17	o–Xylene	0.006	0.009	0.066	0.066
19	Bis(2–ethylhexyl) phthalate	0.154	0.016	0.130	0.130
23	Hexachlorobutadiene	*	0.001	0.001	0.001
23	Hexachloroethane	*	*	0.001	0.001
24	Octachlorodibenzo–p–dioxin	*	*	*	*
24	Octachlorodibenzofuran	*	*	*	*
25	Oil and grease	33.461	3.195	38.147	38.147

EXPLANATORY NOTES:
(i) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0100 – Intake Water to Site
PR 0200 – Carbon Contactor Effluent flows into CO 0300
CO 0300 – Effluent to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
ESSO CHEMICALS CANADA

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ESSO CHEMICAL CANADA - SARNIA

CONTROL POINT - PR 0200 Carbon Contactor Effluent flows into CO 0300
AVERAGE FLOWRATE = 2549 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	31	77.006	31	77.006	31	77.006	31	77.006	Esso	Esso	Esso
2	Cyanide Total	0.005	mg/L	0.014	0.030	0.014	0.030	0.014	0.030	0.014	0.030	Esso	Esso	Esso
4	Ammonia plus Ammonium	0.25	mg/L	0.10	0.266	0.10	0.266	0.10	0.266	0.10	0.266	Esso	Esso	Esso
4	Nitrate+Nitrite	0.25	mg/L	0.35	0.925	0.35	0.925	0.35	0.925	0.35	0.925	Esso	Esso	Esso
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	0.762	0.3	0.762	0.3	0.762	0.3	0.762	Esso	Esso	Esso
5	DOC	0.5	mg/L	4.4	11.452	4.4	11.452	4.4	11.452	4.4	11.452	Esso	Esso	Esso
5	TOC	5	mg/L	5	12.233	5	12.233	5	12.233	5	12.233	Esso	Esso	Esso
6	Total phosphorus	0.10	mg/L	0.03	0.079	0.03	0.079	0.03	0.079	0.03	0.079	Esso	Esso	Esso
8	Total suspended solids	5	mg/L	6	17.041	6	17.041	6	17.041	6	17.041	Esso	Esso	Esso
8	Volatile suspended solids	10	mg/L	3	7.884	3	7.884	3	7.884	3	7.884	Esso	Esso	Esso
9	Aluminum	30.0	ug/L	74.2	0.166	74.2	0.166	74.2	0.166	74.2	0.166	Esso	Esso	Esso
9	Copper	10.0	ug/L	19.7	0.049	19.7	0.049	19.7	0.049	19.7	0.049	Esso	Esso	Esso
9	Zinc	10.0	ug/L	19.3	0.049	19.3	0.049	19.3	0.049	19.3	0.049	Esso	Esso	Esso
14	Phenolics (4AAP)	2.0	ug/L	2.5	0.007	2.5	0.007	2.5	0.007	2.5	0.007	Esso	Esso	Esso
16	Bromodichloromethane	0.8	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Esso	Esso	Esso
16	Chloroform	0.7	ug/L	1.2	0.003	1.2	0.003	1.2	0.003	1.2	0.003	Esso	Esso	Esso
16	Tetrachloroethylene	1.1	ug/L	2.1	0.006	2.1	0.006	2.1	0.006	2.1	0.006	Esso	Esso	Esso
16	Vinyl chloride	4.0	ug/L	2.6	0.011	2.6	0.011	2.6	0.011	2.6	0.011	Esso	Esso	Esso
17	Benzene	0.5	ug/L	3.4	0.011	3.4	0.011	3.4	0.011	3.4	0.011	Esso	Esso	Esso
17	Toluene	0.5	ug/L	5.4	0.018	5.4	0.018	5.4	0.018	5.4	0.018	Esso	Esso	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	5.0	0.017	5.0	0.017	5.0	0.017	5.0	0.017	Esso	Esso	Esso
17	o-Xylene	0.5	ug/L	2.6	0.009	2.6	0.009	2.6	0.009	2.6	0.009	Esso	Esso	Esso
19	Bis(2-ethylhexyl)phthalate	2.2	ug/L	5.9	0.016	5.9	0.016	5.9	0.016	5.9	0.016	Esso	Esso	Esso
23	Hexachlorobutadiene	10.0	ng/L	217.3	0.001	217.3	0.001	217.3	0.001	217.3	0.001	Esso	Esso	Esso
23	Hexachloroethane	10.0	ng/L	72.8	*	72.8	*	72.8	*	72.8	*	Esso	Esso	Esso
25	Oil & Grease	1.0	mg/L	1.3	3.195	1.3	3.195	1.3	3.195	1.3	3.195	Esso	Esso	Esso

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ESSO CHEMICAL CANADA - SARNIA

CONTROL POINT - CO 0300 Effluent to River
AVERAGE FLOWRATE = 28941 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL A.ERAGE CONC	BAT OPTION 3 ANNUAL A.ERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	30	771.361	30	771.361	30	771.361	30	771.361	Esso	Esso	Esso
2	Cyanide Total	0.005	mg/L	0.011	0.277	0.011	0.277	0.011	0.277	0.011	0.277	Esso	Esso	Esso
4	Ammonia plus Ammonium	0.25	mg/L	0.10	2.552	0.10	2.552	0.10	2.552	0.10	2.552	Esso	Esso	Esso
4	Nitrate+Nitrite	0.25	mg/L	0.22	5.754	0.22	5.754	0.22	5.754	0.22	5.754	Esso	Esso	Esso
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	6.034	0.2	6.034	0.2	6.034	0.2	6.034	Esso	Esso	Esso
5	DOC	0.5	mg/L	6.7	191.832	6.7	191.832	6.7	191.832	4.4	127.340	Esso	Esso	PR0200
5	TOC	5	mg/L	7	206.286	7	206.286	7	206.286	5	144.705	Esso	Esso	PR0200
6	Total phosphorus	0.10	mg/L	0.03	0.718	0.03	0.718	0.03	0.718	0.03	0.718	Esso	Esso	Esso
8	Total suspended solids	5	mg/L	6	181.103	6	181.103	6	181.103	6	181.103	Esso	Esso	Esso
8	Volatile suspended solids	10	mg/L	6	164.057	6	164.057	6	164.057	6	164.057	Esso	Esso	Esso
9	Aluminum	30.0	ug/L	56.7	1.560	56.7	1.560	56.7	1.560	56.7	1.560	Esso	Esso	Esso
9	Copper	10.0	ug/L	23.3	0.681	23.3	0.681	23.3	0.681	23.3	0.681	Esso	Esso	Esso
9	Zinc	10.0	ug/L	23.2	0.685	23.2	0.685	23.2	0.685	23.2	0.685	Esso	Esso	Esso
14	Phenolics (4AAP)	2.0	ug/L	2.2	0.062	2.2	0.062	2.2	0.062	2.2	0.062	Esso	Esso	Esso
16	Bromodichloromethane	0.8	ug/L	0.9	0.025	0.9	0.025	0.9	0.025	0.4	0.012	Esso	Esso	PR0200
16	Chloroform	0.7	ug/L	3.0	0.081	3.0	0.081	3.0	0.081	1.2	0.035	Esso	Esso	PR0200
16	Tetrachloroethylene	1.1	ug/L	0.5	0.014	0.5	0.014	0.5	0.014	0.5	0.014	Esso	Esso	Esso
16	Vinyl chloride	4.0	ug/L	7.7	0.202	7.7	0.202	7.7	0.202	2.6	0.075	Esso	Esso	PR0200
17	Benzene	0.5	ug/L	4.7	0.135	4.7	0.135	4.7	0.135	3.4	0.098	Esso	Esso	PR0200
17	Toluene	0.5	ug/L	4.9	0.145	4.9	0.145	4.9	0.145	4.9	0.145	Esso	Esso	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	4.5	0.129	4.5	0.129	4.5	0.129	4.5	0.129	Esso	Esso	Esso
17	o-Xylene	0.5	ug/L	2.3	0.066	2.3	0.066	2.3	0.066	2.3	0.066	Esso	Esso	Esso
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	5.2	0.130	5.2	0.130	5.2	0.130	5.2	0.130	Esso	Esso	Esso
23	Hexachlorobutadiene	10.0	ng/L	55.3	0.001	55.3	0.001	55.3	0.001	55.3	0.001	Esso	Esso	Esso
23	Hexachloroethane	10.0	ng/L	16.0	0.001	16.0	0.001	16.0	0.001	16.0	0.001	Esso	Esso	Esso
25	Oil and grease	1.0	mg/L	1.3	38.147	1.3	38.147	1.3	38.147	1.3	38.147	Esso	Esso	Esso

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ESSO CHEMICAL CANADA - SARNIA

CONTROL POINT - CO 0300 Effluent to River
AVERAGE FLOWRATE = 28941 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL A.ERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	30	771.361	30	771.361	30	771.361	30	771.361	Esso	Esso	Esso
2	Cyanide Total	0.005	mg/L	0.011	0.277	0.011	0.277	0.011	0.277	0.011	0.277	Esso	Esso	Esso
4	Ammonia plus Ammonium	0.25	mg/L	0.10	2.552	0.10	2.552	0.10	2.552	0.10	2.552	Esso	Esso	Esso
4	Nitrate+Nitrite	0.25	mg/L	0.22	5.754	0.22	5.754	0.22	5.754	0.22	5.754	Esso	Esso	Esso
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	6.034	0.2	6.034	0.2	6.034	0.2	6.034	Esso	Esso	Esso
5	DOC	0.5	mg/L	6.7	191.832	6.7	191.832	6.7	191.832	4.4	127.340	Esso	Esso	PR0200
5	TOC	5	mg/L	7	206.286	7	206.286	7	206.286	5	144.705	Esso	Esso	PR0200
6	Total phosphorus	0.10	mg/L	0.03	0.718	0.03	0.718	0.03	0.718	0.03	0.718	Esso	Esso	Esso
8	Total suspended solids	5	mg/L	6	181.103	6	181.103	6	181.103	6	181.103	Esso	Esso	Esso
8	Volatile suspended solids	10	mg/L	6	164.057	6	164.057	6	164.057	6	164.057	Esso	Esso	Esso
9	Aluminum	30.0	ug/L	56.7	1.560	56.7	1.560	56.7	1.560	56.7	1.560	Esso	Esso	Esso
9	Copper	10.0	ug/L	23.3	0.681	23.3	0.681	23.3	0.681	23.3	0.681	Esso	Esso	Esso
9	Zinc	10.0	ug/L	23.2	0.685	23.2	0.685	23.2	0.685	23.2	0.685	Esso	Esso	Esso
14	Phenolics (4AAP)	2.0	ug/L	2.2	0.062	2.2	0.062	2.2	0.062	2.2	0.062	Esso	Esso	Esso
16	Bromodichloromethane	0.8	ug/L	0.9	0.025	0.9	0.025	0.9	0.025	0.4	0.012	Esso	Esso	PR0200
16	Chloroform	0.7	ug/L	3.0	0.081	3.0	0.081	3.0	0.081	1.2	0.035	Esso	Esso	PR0200
16	Tetrachloroethylene	1.1	ug/L	0.5	0.014	0.5	0.014	0.5	0.014	0.5	0.014	Esso	Esso	Esso
16	Vinyl chloride	4.0	ug/L	7.7	0.202	7.7	0.202	7.7	0.202	2.6	0.075	Esso	Esso	PR0200
17	Benzene	0.5	ug/L	4.7	0.135	4.7	0.135	4.7	0.135	3.4	0.098	Esso	Esso	PR0200
17	Toluene	0.5	ug/L	4.9	0.145	4.9	0.145	4.9	0.145	4.9	0.145	Esso	Esso	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	4.5	0.129	4.5	0.129	4.5	0.129	4.5	0.129	Esso	Esso	Esso
17	o-Xylene	0.5	ug/L	2.3	0.066	2.3	0.066	2.3	0.066	2.3	0.066	Esso	Esso	Esso
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	5.2	0.130	5.2	0.130	5.2	0.130	5.2	0.130	Esso	Esso	Esso
23	Hexachlorobutadiene	10.0	ng/L	55.3	0.001	55.3	0.001	55.3	0.001	55.3	0.001	Esso	Esso	Esso
23	Hexachloroethane	10.0	ng/L	16.0	0.001	16.0	0.001	16.0	0.001	16.0	0.001	Esso	Esso	Esso
25	Oil and grease	1.0	mg/L	1.3	38.147	1.3	38.147	1.3	38.147	1.3	38.147	Esso	Esso	Esso

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

ETHYL CANADA INC.

1.0 PLANT DESCRIPTION

The Ethyl Canada plant at Corunna is located south of the Shell refinery along the St. Clair River. Production of tetraethyl lead (TEL) from lead-sodium alloy and ethyl chloride began at the site in 1956. Since that time, the site has expanded production to include tetramethyl lead, ethyl chloride, diesel ignition improvers and aluminum alkyls. Table 1.0 presents a summary of Ethyl's production units.

TABLE 1.0
PRODUCTS AND END USES FOR ETHYL CANADA INC.

PRODUCT	END USES
1. Lead Antiknocks · TEL (Tetraethyl Lead) · TML (Tetramethyl Lead) · Mixed TEL/TML	· Automotive and jet fuel additives
2. Ethyl chloride (EtCl)	· Used in production of TEL
3. Diesel Ignition Improves (DII)	· Diesel fuel additive
4. Industrial Chemicals Unit (ICU)	· Aluminum alkyl catalysts

2.0 WASTEWATER SOURCES AND QUALITY

Contaminated TEL wastewater is directed to a sludge pit for settling of lead solids. Effluent from the sludge PIT is pH adjusted and treated with sodium borohydride to reduce alkyl lead to inorganic lead. The resulting lead particles are removed in a lamella settler and by filtration in a Hydromation filter. The effluent (MISA Control Point PR 0300) is discharged to the plant combined sewer system.

Process effluent from ethyl chloride and diesel ignition improver production is neutralized in a limestone pit (MISA Control Point PR 0200) and discharged to the combined sewer system.

The process effluents, spent once-through cooling water and storm water are discharged through a single outfall to the St. Clair River (MISA Control Point CO 0100).

Ethyl Canada has made an application to the Ministry of the Environment for a certificate of approval in conjunction with a proposed plan to double its current Tetra Ethyl Lead (TEL) production capacity. The project also included major additions and modifications to enhance the performance and capacity of the lead alkyls effluent water treatment system. Contaminants in the effluent water were projected to be reduced by a factor of two including a 23% reduction in the quantity of lead discharged. The impact of these modifications on the plant's effluent including a description of the proposed wastewater treatment plant and effluent quality are described in detail in an Ethyl report to the Ministry of Environment (Ref. 1). Since the writing of this report, Ethyl has decided not to proceed with the TEL expansion. The status of the proposed modifications to the existing wastewater treatment plant are unknown.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 2).

2.1 WASTEWATER SOURCES

Process wastewater is generated from the TEL/TML unit, the EtCl unit, and the DII unit only. The Industrial Chemicals Unit (ICU) involves blending and repackaging operations only and does not produce any wastewater.

The sources of wastewater resulting from the TEL/TML production unit (which make up the discharge to MISA Control Point PR 0300) include:

- lead recovery furnace scrubber water
- steam still condensate
- lead recovery furnace dryer vacuum jet
- air sampler vacuum system water

Waste heavy ends from the EtCl reactor are hydrolysed using steam and water. The oily fraction of the resulting stream is gravity separated and the acidic water layer is used in a fume scrubber which treats vent gas from the stabilizer feed drum as well as the heavy ends drum. The waste scrubber water is discharged through a neutralization pit which contains crushed limestone (MISA Control Point PR 0200).

The main source of wastewater from the DII Unit is water used in the fume scrubber. In addition, there is a small spent caustic stream used to wash the nitrated product. These two streams are both discharged to the neutralization pit used for the EtCl Unit.

The remaining sources of wastewater at the Ethyl site are storm and non-contact cooling water as well as discharge from the septic facilities serving the administration building.

All process wastewaters are discharged through a combined sewer to the St. Clair River (MISA Control Point CO 0100). In addition to these sources, condensate, cooling water, stormwater and groundwater from the north section of the property all flow to this combined sewer for discharge to the St. Clair River. Table 2.0 presents a summary of wastewater generation sources at the plant by their respective MISA Control Point.

TABLE 2.0
WASTEWATER SOURCES AT ETHYL CANADA INC.

MISA CONTROL POINT	DESCRIPTION
PR 0200	Combined process wastewater from the EtCl and DII Units, flows into CO 0100
PR 0300	Process wastewater from TEL/TML unit flow into CO 0100
CO 0100	Combined effluent to the river

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results obtained from the MISA OCM Section Twelve Month Report from MISA Control Point PR 0200, PR 0300, and CO 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period at MISA Control Point CO 0100 were determined to be acutely lethal to Daphnia Magna and Rainbow Trout. An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity Unit did not reveal any probable causes of the observed acute toxicity (Ref. 3).

Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Point CO 0100 to assess the toxicity problems identified. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 4).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction.

3.2.1 MISA Control Point PR 0200 (Neutralization Pit Effluent)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point PR 0200 showed elevated concentrations of metals and volatile organic pollutants.

High levels of contaminants included aluminum (91,099.9 ug/l), copper (91.4 ug/l), lead (534.3 ug/l), nickel (107.8 ug/l), zinc (91.7 ug/l), 1,1-dichloroethane (7,760.9 ug/l), chloromethane (938.9 ug/l), methylene chloride (1,344.1 ug/l), 1,2-dichloroethane (218.5 ug/l), toluene (452.5 ug/l), and chloroform

(248.2 ug/l). Based on the pollutant concentrations present, chemical precipitation for metal reduction and steam stripping for organic pollutant reduction as well as granular activated carbon and multimedia filtration are recommended for MISA Control Point PR 0200. Chemical precipitation and steam stripping have been demonstrated to reduce metal and volatile pollutant concentration, respectively, while the installation of granular activated carbon/multimedia filtration will further reduce both metals and organics concentrations.

3.2.2 MISA Control Point PR 0300 (TEL Process Effluent)

The draft analytical results obtained for MISA Control Point PR 0300 from the OCM Sector Twelve Month Report showed elevated concentrations of conventional pollutants, metals and volatile organic pollutants.

High levels of contaminants included COD (2,200 mg/l), aluminum (20,128.8 ug/l), lead (16,710.2 ug/l), boron (2,650 ug/l), 1,2-dichloroethane (2,475.7 ug/l), chloromethane (239.7 ug/l), methylene chloride (554.2 ug/l), and toluene (325.1 ug/l).

Based on the pollutant concentrations present, it is recommended that the overflow from the existing lamella clarifier be routed to a chemical precipitation system, followed by multimedia filtration and steam stripping. It is also recommended that the lamella clarifier bottoms, combined with the recommended chemical precipitation sludge slurry be steam stripped. The bottoms of this stripper will flow into an equalization basin followed by a belt filter press for sludge dewatering.

3.2.3 MISA Control Point CO 0100 (Final Effluent to River)

The draft analytical results obtained from the MISA OCM Sector Six Month Report for MISA control Point CO 0100 showed elevated concentrations and pollutant loadings for metals and organic pollutants.

Elevated levels of contaminants included: aluminum (3041.8 ug/l), lead (381.3 ug/l), 1,1-dichloroethane (128.1 ug/l), 1,2-dichloroethane (131.5 ug/l), methylene chloride (89.0 ug/l) and toluene (49.7 ug/l).

The same pollutants were also found at high concentrations in the analytical results from the plant's two process wastestreams (PR 0200 and PR 0300) which eventually flow into MISA Control Point CO 0100. It is expected that with the pollutant reduction that will be achieved with the installation of the

technologies recommended for MISA Control Points PR 0200 and PR 0300 for BAT Option 2, the current effluent pollutant concentrations for the combined effluent (CO 0100) will be reduced to intake water levels.

However, an analysis of the plant's current pollutant loadings, as documented in the MISA OCM Sector Twelve Month Report, showed that the two process effluent wastestreams are only contributing a small fraction of the pollutant loadings found in MISA Control Point CO 0100. Table 3.0 presents the results of this analysis for selected pollutants.

TABLE 3.0
CURRENT POLLUTANT LOADINGS BY CONTRIBUTING SOURCE
ETHYL CANADA, INC

POLLUTANT NAME	PR 0200 CURRENT LOADING (kg/day)	PR 0300 CURRENT LOADING (kg/day)	CO 0100 TOTAL LOADING (kg/day)	PERCENT OF LOADING FROM PROCESS RELATED STREAMS PR 0200 AND PR 0300 (%)
1,2-Dichloroethane	0.052	2.073	4.715	45.1
1,1-Dichloroethane	1.751	0.009	4.458	39.5
Toluene	0.090	0.304	1.651	23.9
Methylene chloride	0.365	0.368	2.894	25.3
Aluminum	23.330	14.085	104.686	35.7
Lead	0.121	11.716	12.421	95.3
TSS	6.464	39.226	385.470	11.9

Based on results of Table 3.0, even if the current pollutant loadings from MISA Control Points PR 0200 and PR 0300 were to be eliminated as a result of the installation of the technologies recommended for BAT Option 2, the current total pollutant concentrations (CO 0100) for these selected parameters will not be reduced to BAT levels.

As indicated earlier in this report (Section 2), in addition to the two process wastestreams (PR 0200 and PR 0300), stormwater runoff, cooling water and condensate are combined in MISA Control Point CO 0100 for discharge to the St. Clair River. It is likely that the source(s) of contamination can be attributed to the stormwater and/or cooling water; however, no monitoring data are available from either the stormwater or the cooling water streams that flow into MISA Control Point CO 0100. Based on this assessment, the

development of a Best Management Practices (BMP) Plan is recommended at MISA Control Point CO 0100 for BAT Option 2 to control the metals and organic pollutants present. This pollution prevention approach should focus on the identification of the source(s) and implementation of methods of control of the metals and organic pollutants. A draft report prepared by Environment Canada outlines guidelines for a development and implementation of a BMP Plan (Ref. 5).

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants, including current technologies, or combination of current technologies, supplemental/add-on technologies or cross-over technologies from other industrial sectors.

3.3.1 MISA Control Points PR 0200 and PR 0300

Based on the pollutant concentrations currently present, vapor compression distillation and recycle is recommended for MISA Control Points PR 0200 and PR 0300, primarily for the removal of aluminum and other sources of total dissolved solids (TDS) as well as other pollutants present in these discharges. Although this technology is not currently in use in the OCM Sector, vapor compression distillation with recycle is an evaporative technology that can achieve zero discharge of wastewater to receiving waters. However, pollutants are not destroyed, but rather transferred to either the air or removed as a solid waste.

Brine concentration, using vapor compression evaporators has been widely used to concentrate effluents in the treatment of cooling tower blowdown and other concentrated TDS streams in the electric power generating industry. This process produces a concentrate that can be disposed, or further concentrated by crystallization or spray drying to produce a solid for disposal. The resulting high quality condensate can be reused in the plant, as boiler make-up, or for other uses, without requiring additional treatment (Ref. 6). In addition, vapor compression distillation and recycle has been recommended as a method of achieving zero discharge by the U.S. EPA for the Iron and Steel Manufacturing Sector (Ref. 7).

3.3.2 MISA Control Point CO 0100

BAT Option 3 for MISA Control Point CO 0100 is set equal to BAT Option 2. A Best Management Practices (BMP) Plan is recommended for the control of the metals and organic pollutants present. However, if the BMP investigation can not adequately identify the non-point sources of these pollutants,

vapor compression distillation is recommended for MISA Control Point CO 0100. If this becomes necessary, vapor compression distillation will no longer be necessary at MISA Control Points PR 0200 and PR 0300.

3.4 SUMMARY OF BAT OPTIONS

Table 4.0 presents a summary of BAT options recommended for Ethyl Canada Inc.

TABLE 4.0
SUMMARY OF BAT OPTIONS FOR
ETHYL CANADA INC.

BAT OPTION	DEFINITION	DESCRIPTION
A) MISA CONTROL POINT PR 0200		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater to oil separation, steam stripper, chemical precipitation, multimedia filtration and granular activated carbon.
3	Zero Discharge/Virtual Elimination	Vapor Compression Distillation and Recycle
B) MISA CONTROL POINT PR 0300		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Lamella clarifier overflow to chemical precipitation multimedia filter and steam stripping. · Lamella clarifier bottoms combined with chemical precipitation sludge slurry to steam stripper. Bottoms of stripper to equalization tank and belt filter press.
3	Zero Discharge/Virtual Elimination	Vapor Compression Distillation and Recycle
C) MISA CONTROL POINT CO 0100		
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	BMP (metals, organics)
3	Zero Discharge/Virtual Elimination	Same as BAT Option 2

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with the control the treatment technologies considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry wide basis. The average flow as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance cost estimates presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Ethyl Canada Inc. for chemical precipitation, steam stripping, secondary clarification, sludge dewatering, and multimedia filtration were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibres Point Source Category EPA 440/1-87/009, October 1987 (Ref. 5), while the cost estimates associated with vapor compression, distillation, and recycle were obtained from the Development Document for Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category EPA 440/1-82//024, May 1982 (Ref. 7).

Table 5.0 presents the cost estimates developed for the technologies considered for each BAT Options for MISA Control Points PR 0200, PR 0300, and CO 0100 at Ethyl Canada Inc. Cost estimates for development and implementation of a TIE Study and a BMP Plan could not be developed due to the site-specific nature of the study. As noted in Section 3.3.2, if the BMP investigation is not successful, vapor compression distillation has been recommended at MISA Control Point CO 0100 for BAT Option 3 and the cost for this technology have been included in Table 5.0 for comparison purposes.

TABLE 5.0
BAT OPTION MODELS COST ESTIMATES
ETHYL CANADA INC.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL COST ($)	O&M COST $/YEAR	TECHNOLOGY	CAPITAL COST ($)	O&M COST $/YEAR	TECHNOLOG'	CAPITAL COST ($)	O&M COST ($/YEAR)	TECHNOLOGY
PR 0200	320	0	0	NAT	474,700 957,600 660,800 630,800 2,723,900	43,900 123,200 409,200 56,600 632,900	FIL SS GAC CP TOTAL	6,975,300	439,000	EVAP
PR 0300	965 84	0	0	NAT	705,200 1,177,400 600,000 876,700 50,000 268,500 3,677,800	80,700 408,500 54,400 41,200 20,000 21,100 625,900	CP SS FIL SS EQUAL BFP TOTAL	10,764,500	893,200	EVAP
CO 0100	40,110	NA	NA	TIE	NA	NA	BMP's	240,671,000 NA	28,451,700 NA	EVAP BMP's

NOTES:

NAT - No additional treatment
NA - Cost Estimates not developed
CP - Chemical Precipitation
SS - Steam Stripping
TIE - Toxicity Investigation Evaluation

EVAP - Vapor Compression, Distillation and Recycle
FIL - Filtration
EQUAL - Equalization
BFP - Belt Filter Press (sludge dewatering)
BMP's - Best Management Practices

6.0 REFERENCES

1. Ethyl Canada Inc. "Proposed Water Treatment System" April 18, 1991.

2. Ethyl Canada Inc. - BAT Status of OCM Sector Plants Site Visit Information Report, April 25, 1991.

3. Lee, J.T., Logan, C.S., Mueller, M.C., Poirier, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

4. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

5. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and their Application to Ontario's MISA Program", May 1987.

6. General Technology Report on Vapour Compression Evaporation for TDS Removal.

7. Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA 440/1-87/024, May 1982.

8. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR ETHYL CANADA INC.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – ETHYL CANADA INC. – CORUNNA

ATG	PARAMETER	RMDL	UNIT	IN 0800	PR 0200	PR 0300	CO 0100
1	COD	10	mg/L	22	314	2200	22
2	Cyanide Total	0.005	mg/L	0.001	0.010	0.001	0.001
3	Hydrogen ion (pH)			–	3.7	9.2	7.9
4	Ammonia plus Ammonium	0.25	mg/L	0.08	0.06	0.69	0.32
4	Nitrate+Nitrite	0.25	mg/L	1.51	20.09	0.29	0.49
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	0.6	1.1	1.0
5	DOC	0.5	mg/L	2.6	6.7	20.1	2.1
5	TOC	5	mg/L	–	13	22	3
6	Total phosphorus	0.10	mg/L	0.07	0.09	0.18	0.20
7	Specific conductance	5	uS/cm	–	11591	80307	2299
8	Total suspended solids	5	mg/L	6	24	51	12
8	Volatile suspended solids	10	mg/L	4	17	7	8
9	Aluminum	30.0	ug/L	83.0	91099.9	20128.8	3041.8
9	Boron	50.0	ug/L	13.0	27.2	2650.0	72.5
9	Chromium	20.0	ug/L	2.0	51.5	5.7	2.7
9	Copper	10.0	ug/L	2.5	91.4	5.3	9.3
9	Lead	30.0	ug/L	10.0	534.3	16710.2	381.3
9	Nickel	20.0	ug/L	9.0	107.8	9.4	9.0
9	Thallium	30.0	ug/L	10.0	36.8	18.6	10.9
9	Zinc	10.0	ug/L	4.0	91.7	52.8	17.5
12	Mercury	0.10	ug/L	0.04	0.16	0.36	0.60
13	Tetra–alkyl lead (Total)	2.0	ug/L	–	2.3	262.6	4.1
13	Tri–alkyl lead (Total)	2.0	ug/L	–	34.1	405.4	24.6
14	Phenolics (4AAP)	2.0	ug/L	0.7	19.6	176.6	9.1
15	Sulphide	20.0	ug/L	35.0	84.0	137.5	32.5
16	1,1,2,2–Tetrachloroethane	4.3	ug/L	0.4	51.9	5.8	5.8
16	1,1,2–Trichloroethane	0.6	ug/L	0.6	92.3	10.1	10.1
16	1,1–Dichloroethane	0.8	ug/L	0.5	7760.9	9.3	128.1
16	1,1–Dichloroethylene	2.8	ug/L	0.4	118.4	12.6	12.9
16	1,2–Dichlorobenzene	1.4	ug/L	0.4	63.0	6.9	6.9
16	1,2–Dichloroethane	0.8	ug/L	0.4	218.5	2475.7	131.5
16	1,2–Dichloropropane	0.9	ug/L	0.5	84.1	9.7	9.1
16	1,3–Dichlorobenzene	1.1	ug/L	0.3	49.5	5.4	5.4
16	1,4–Dichlorobenzene	1.7	ug/L	0.2	35.2	3.9	3.9
16	Bromodichloromethane	0.8	ug/L	0.4	63.0	16.5	13.2
16	Bromoform	3.7	ug/L	0.4	49.6	5.5	5.5
16	Bromomethane	3.7	ug/L	2.4	411.8	46.7	45.4
16	Carbon tetrachloride	1.3	ug/L	0.3	47.2	5.2	5.2
16	Chlorobenzene	0.7	ug/L	0.6	94.5	10.4	10.4
16	Chloroform	0.7	ug/L	0.4	248.2	24.9	40.3
16	Chloromethane	3.7	ug/L	2.3	938.9	239.7	56.4
16	Cis–1,3–Dichloropropylene	1.4	ug/L	0.7	110.2	12.1	12.1
16	Dibromochloromethane	1.1	ug/L	0.4	65.3	7.2	9.0
16	Ethylene dibromide	1.0	ug/L	0.6	163.8	79.9	12.7
16	Methylene chloride	1.3	ug/L	0.3	1344.1	554.2	89.0
16	Tetrachloroethylene	1.1	ug/L	0.2	26.9	3.6	3.7
16	Trans–1,2–Dichloroethylene	1.4	ug/L	0.4	65.3	7.2	7.2
16	Trans–1,3–Dichloropropylene	1.4	ug/L	1.1	173.2	19.0	19.0
16	Trichloroethylene	1.9	ug/L	0.3	47.2	5.2	5.2
16	Trichlorofluoromethane	1.0	ug/L	0.3	47.2	5.2	5.2
16	Vinyl chloride	4.0	ug/L	2.9	521.1	84.8	53.8

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – ETHYL CANADA INC. – CORUNNA

ATG	PARAMETER	RMDL	UNIT	IN 0800	PR 0200	PR 0300	CO 0100
17	Benzene	0.5	ug/L	0.2	116.0	10.0	14.1
17	Ethylbenzene	0.6	ug/L	0.4	58.4	6.4	6.2
17	Styrene	0.5	ug/L	0.4	58.4	6.4	6.2
17	Toluene	0.5	ug/L	0.4	452.5	325.1	49.7
17	m–Xylene and p–Xylene	1.1	ug/L	0.5	88.5	8.4	8.3
17	o–Xylene	0.5	ug/L	0.4	65.3	7.3	7.2
19	1–Methylnaphthalene	3.2	ug/L	2.2	2.2	17.5	2.2
19	2–Methylnaphthalene	2.2	ug/L	1.5	1.5	11.4	1.5
19	Acenaphthene	1.3	ug/L	0.7	0.7	9.5	0.7
19	Benzylbutylphthalate	0.6	ug/L	0.8	0.6	0.6	0.6
19	Biphenyl	0.6	ug/L	0.4	0.4	5.2	0.4
19	Fluorene	1.7	ug/L	0.3	0.3	5.6	0.3
19	Indole	1.9	ug/L	1.2	1.2	437.0	7.5
19	Naphthalene	1.6	ug/L	0.3	0.4	5.8	0.3
19	Phenanthrene	0.4	ug/L	0.3	0.3	4.1	0.3
20	Phenol	2.4	ug/L	1.1	1.1	36.0	1.1
20	m–Cresol	3.4	ug/L	3.0	3.0	5.5	3.0
20	o–Cresol	3.7	ug/L	1.7	1.7	5.1	1.7
20	p–Cresol	3.5	ug/L	3.5	3.5	5.6	3.5
25	Oil and grease	1.0	mg/L	1.1	8.9	5.9	1.3
98	Ftflow		m3/day	–	207	590	31080

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0800 – Intake Water to Site
CO 0100 – Final Effluent to River
PR 0200 – Neutralization Pit Effluent flows into CO 0100
PR 0300 – TEL Process Effluent flows into CO 0100

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – ETHYL CANADA INC. – CORUNNA

ATG	PARAMETER	IN 0800	PR 0200	PR 0300	CO 0100	TOTAL
1	COD	653.466	62.422	1479.500	818.070	818.070
2	Cyanide Total	0.014	0.002	0.001	0.035	0.035
4	Ammonia plus Ammonium	2.266	0.011	0.435	11.720	11.720
4	Nitrate+Nitrite	43.809	7.361	0.193	16.300	16.300
4	Total Kjeldahl Nitrogen	5.683	0.123	0.642	35.661	35.661
5	DOC	77.098	1.320	14.517	66.288	66.288
5	TOC	–	2.751	16.617	85.809	85.809
6	Total phosphorus	2.083	0.017	0.214	6.238	6.238
8	Total suspended solids	166.186	6.464	39.226	385.470	385.470
8	Volatile suspended solids	104.906	3.280	4.166	282.542	282.542
9	Aluminum	2.432	23.330	14.085	104.686	104.686
9	Boron	0.387	0.005	2.173	2.527	2.527
9	Chromium	0.060	0.010	0.004	0.097	0.097
9	Copper	0.074	0.016	0.004	0.327	0.327
9	Lead	0.300	0.121	11.716	12.421	12.421
9	Nickel	0.270	0.019	0.008	0.317	0.317
9	Thallium	0.300	0.007	0.018	0.375	0.375
9	Zinc	0.120	0.018	0.036	0.627	0.627
12	Mercury	0.001	*	*	0.020	0.020
13	Tetra–alkyl lead (Total)	–	*	0.186	0.136	0.136
13	Tri–alkyl lead (Total)	–	0.009	0.254	0.876	0.876
14	Phenolics (4AAP)	0.020	0.004	0.099	0.311	0.311
15	Sulphide	1.055	0.018	0.085	1.150	1.150
16	1,1,2,2–Tetrachloroethane	0.013	0.010	0.006	0.176	0.176
16	1,1,2–Trichloroethane	0.018	0.017	0.010	0.311	0.311
16	1,1–Dichloroethane	0.015	1.751	0.009	4.458	4.458
16	1,1–Dichloroethylene	0.012	0.024	0.012	0.414	0.414
16	1,2–Dichlorobenzene	0.012	0.012	0.007	0.212	0.212
16	1,2–Dichloroethane	0.012	0.052	2.073	4.715	4.715
16	1,2–Dichloropropane	0.015	0.016	0.010	0.280	0.280
16	1,3–Dichlorobenzene	0.009	0.009	0.005	0.166	0.166
16	1,4–Dichlorobenzene	0.006	0.007	0.004	0.118	0.118
16	Bromodichloromethane	0.012	0.012	0.018	0.400	0.400
16	Bromoform	0.011	0.009	0.006	0.168	0.168
16	Bromomethane	0.072	0.076	0.048	1.378	1.378
16	Carbon tetrachloride	0.009	0.009	0.005	0.159	0.159
16	Chlorobenzene	0.018	0.017	0.011	0.318	0.318
16	Chloroform	0.012	0.048	0.025	1.257	1.257
16	Chloromethane	0.069	0.245	0.184	1.867	1.867
16	Cis–1,3–Dichloropropylene	0.021	0.020	0.013	0.371	0.371
16	Dibromochloromethane	0.012	0.012	0.007	0.281	0.281
16	Ethylene dibromide	0.018	0.043	0.057	0.408	0.408
16	Methylene chloride	0.009	0.365	0.368	2.894	2.894
16	Tetrachloroethylene	0.006	0.005	0.004	0.113	0.113
16	Trans–1,2–Dichloroethylene	0.012	0.012	0.007	0.219	0.219
16	Trans–1,3–Dichloropropylene	0.033	0.032	0.020	0.584	0.584
16	Trichloroethylene	0.009	0.009	0.005	0.159	0.159
16	Trichlorofluoromethane	0.009	0.009	0.005	0.159	0.159
16	Vinyl chloride	0.087	0.098	0.070	1.680	1.680

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – ETHYL CANADA INC. – CORUNNA

ATG	PARAMETER	IN 0800	PR 0200	PR 0300	CO 0100	TOTAL
17	Benzene	0.006	0.020	0.011	0.445	0.445
17	Ethylbenzene	0.012	0.011	0.006	0.192	0.192
17	Styrene	0.012	0.011	0.006	0.192	0.192
17	Toluene	0.012	0.090	0.304	1.651	1.651
17	m–Xylene and p–Xylene	0.015	0.015	0.009	0.255	0.255
17	o–Xylene	0.012	0.012	0.007	0.223	0.223
19	1–Methylnaphthalene	0.066	*	0.014	0.077	0.077
19	2–Methylnaphthalene	0.045	*	0.010	0.053	0.053
19	Acenaphthene	0.021	*	0.008	0.025	0.025
19	Benzylbutylphthalate	0.022	*	*	0.021	0.021
19	Biphenyl	0.012	*	0.004	0.014	0.014
19	Fluorene	0.009	*	0.005	0.011	0.011
19	Indole	0.036	*	0.352	0.260	0.260
19	Naphthalene	0.009	*	0.004	0.011	0.011
19	Phenanthrene	0.009	*	0.003	0.011	0.011
20	Phenol	0.033	*	0.022	0.038	0.038
20	m–Cresol	0.090	0.001	0.004	0.103	0.103
20	o–Cresol	0.051	*	0.003	0.059	0.059
20	p–Cresol	0.105	0.001	0.004	0.120	0.120
25	Oil and grease	32.513	2.026	4.702	42.278	42.278

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0800 – Intake Water to Site
CO 0100 – Final Effluent to River
PR 0200 – Neutralization Pit Effluent flows into CO 0100
PR 0300 – TEL Process Effluent flows into CO 0100

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS FOR ETHYL CANADA INC.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ETHYL CANADA INC. - CORUNNA

CONTROL POINT - PR 0200 Neutralization Pit Effluent flows into CO 0100
AVERAGE FLOWRATE = 207 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 NNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	314	62.422	314	62.422	31	6.417	10	2.070	Ethyl	Esso	RMDL
2	Cyanide Total	0 005	mg/L	0.010	0.002	0.010	0.002	0.010	0.002	0.005	0.001	Ethyl	Ethyl	RMDL
4	Ammonia plus Ammonium	0 25	mg/L	0.06	0.011	0.06	0.011	0.06	0.011	0.06	0.012	Ethyl	Ethyl	RMDL
4	Nitrate+Nitrite	0 25	mg/L	20.09	7.361	20.09	7.361	20.09	7.361	0.25	0.052	Ethyl	Ethyl	RMDL
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	0.123	0.6	0.123	0.6	0.123	0.5	0.104	Ethyl	Ethyl	RMDL
5	DOC	0 5	mg/L	6.7	1.320	6.7	1.320	4.4	0.911	0.5	0.104	Ethyl	Esso	RMDL
5	TOC	5	mg/L	13	2.751	13	2.751	5	1.035	5	1.035	Ethyl	Esso	RMDL
6	Total phosphorus	0.10	mg/L	0.09	0.017	0.09	0.017	0.09	0.017	0.09	0.017	Ethyl	Ethyl	Ethyl
8	Total suspended solids	5	mg/L	24	6.464	24	6.464	5	1.035	5	1.035	Ethyl	P1774	P1774
8	Volatile suspended solids	10	mg/L	17	3.280	17	3.280	10	2.070	10	2.070	Ethyl	RREL	RMDL
9	Aluminum	30.0	ug/L	91099.9	23.330	91099.9	23.330	5800	1.201	30	0.006	Ethyl	RREL	RMDL
9	Boron	50.0	ug/L	27.2	0.005	27.2	0.005	27.2	0.005	27.2	0.005	Ethyl	Ethyl	Ethyl
9	Chromium	20.0	ug/L	51.5	0.010	51.5	0.010	51.5	0.010	20	0.004	Ethyl	Ethyl	RMDL
9	Copper	10.0	ug/L	91.4	0.016	91.4	0.016	6.0	0.001	10	0.002	Ethyl	RREL	RMDL
9	Lead	30.0	ug/L	534.3	0.121	534.3	0.121	150.0	0.031	30	0.006	Ethyl	RREL	RMDL
9	Nickel	20.0	ug/L	107.8	0.019	107.8	0.019	67.0	0.014	20	0.004	Ethyl	RREL	RMDL
9	Thallium	30.0	ug/L	36.8	0.007	36.8	0.007	36.8	0.007	30	0.006	Ethyl	Ethyl	RMDL
9	Zinc	10.0	ug/L	91.7	0.018	91.7	0.018	91.7	0.018	10	0.002	Ethyl	Ethyl	RMDL
12	Mercury	0.10	ug/L	0.16	*	0.16	*	0.16	*	0.1	*	Ethyl	Ethyl	RMDL
13	Tetra-alkyl lead (Total)	2.0	ug/L	2.3	*	2.3	*	2.3	*	2	*	Ethyl	Ethyl	RMDL
13	Tri-alkyl lead (Total)	2.0	ug/L	34.1	0.009	34.1	0.009	34.1	0.009	2	*	Ethyl	Ethyl	RMDL
14	Phenolics (4AAP)	2.0	ug/L	19.6	0.004	19.6	0.004	2.5	0.001	2	*	Ethyl	Esso	RMDL
15	Sulphide	20.0	ug/L	84.0	0.018	84.0	0.018	20.0	0.004	20	0.004	Ethyl	Ethyl	RMDL
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	51.9	0.010	51.9	0.010	51.9	0.010	4.3	0.001	Ethyl	Ethyl	RMDL
16	1,1,2-Trichloroethane	0.6	ug/L	92.3	0.017	92.3	0.017	11.2	0.002	0.6	*	Ethyl	913P	RMDL
16	1,1-Dichloroethane	0.8	ug/L	7760.9	1.751	7760.9	1.751	ND(10)	0.002	0.8	*	Ethyl	913P	RMDL
16	1,1-Dichloroethylene	2.8	ug/L	118.4	0.024	118.4	0.024	ND(10)	0.002	2.8	0.001	Ethyl	913P	RMDL
16	1,2-Dichlorobenzene	1.4	ug/L	63.0	0.012	63.0	0.012	63.0	0.012	1.4	*	Ethyl	Ethyl	RMDL
16	1,2-Dichloroethane	0.8	ug/L	218.5	0.052	218.5	0.052	73.3	0.015	0.8	*	Ethyl	913P	RMDL
16	1,2-Dichloropropane	0.9	ug/L	84.1	0.016	84.1	0.016	64.7	0.013	0.9	*	Ethyl	OCPSF	RMDL
16	1,3-Dichlorobenzene	1.1	ug/L	49.5	0.009	49.5	0.009	49.5	0.009	1.1	*	Ethyl	Ethyl	RMDL
16	1,4-Dichlorobenzene	1.7	ug/L	35.2	0.007	35.2	0.007	35.2	0.007	1.7	*	Ethyl	Ethyl	RMDL
16	Bromodichloromethane	0.8	ug/L	63.0	0.012	63.0	0.012	0.4	*	0.8	*	Ethyl	Esso	RMDL
16	Bromoform	3.7	ug/L	49.6	0.009	49.6	0.009	49.6	0.009	3.7	0.001	Ethyl	Ethyl	RMDL
16	Bromomethane	3.7	ug/L	411.8	0.076	411.8	0.076	411.8	0.076	3.7	0.001	Ethyl	Ethyl	RMDL
16	Carbon tetrachloride	1.3	ug/L	47.2	0.009	47.2	0.009	7.0	0.001	1.3	*	Ethyl	RREL	RMDL
16	Chlorobenzene	0.7	ug/L	94.5	0.017	94.5	0.017	64.5	0.013	0.7	*	Ethyl	OCPSF	RMDL
16	Chloroform	0.7	ug/L	248.2	0.048	248.2	0.048	1.2	0.000	0.7	*	Ethyl	Esso	RMDL

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ETHYL CANADA INC. - CORUNNA

CONTROL POINT - PR 0200 Neutralization Pit Effluent flows into CO 0100
AVERAGE FLOWRATE = 207 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL A.ERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Chloromethane	3.7	ug/L	938.9	0.245	938.9	0.245	ND(50)	0.010	3.7	0.001	Ethyl	725T	RMDL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	110.2	0.020	110.2	0.020	64.7	0.013	1.4	*	Ethyl	OCPSF	RMDL
16	Dibromochloromethane	1.1	ug/L	65.3	0.012	65.3	0.012	65.3	0.012	1.1	*	Ethyl	Ethyl	RMDL
16	Ethylene dibromide	1.0	ug/L	163.8	0.043	163.8	0.043	163.8	0.043	1	*	Ethyl	Ethyl	RMDL
16	Methylene chloride	1.3	ug/L	1344.1	0.365	1344.1	0.365	ND(10)	0.002	1.3	*	Ethyl	913P	RMDL
16	Tetrachloroethylene	1.1	ug/L	26.9	0.005	26.9	0.005	2.1	0.000	1.1	*	Ethyl	Esso	RMDL
16	Trans-1,2-Dichloroethylene	1.4	ug/L	65.3	0.012	65.3	0.012	ND(10)	0.002	1.4	*	Ethyl	913P	RMDL
16	Trans-1,3-Dichloropropylene	1.4	ug/L	173.2	0.032	173.2	0.032	64.7	0.013	1.4	*	Ethyl	OCPSF	RMDL
16	Trichloroethylene	1.9	ug/L	47.2	0.009	47.2	0.009	ND(10)	0.002	1.9	*	Ethyl	Ethyl	RMDL
16	Trichlorofluoromethane	1.0	ug/L	47.2	0.009	47.2	0.009	47.2	0.009	1	*	Ethyl	Ethyl	RMDL
16	Vinyl chlonde	4.0	ug/L	521.1	0.098	521.1	0.098	2.6	0.001	4	0.001	Ethyl	Esso	RMDL
17	Benzene	0.5	ug/L	116.0	0.020	116.0	0.020	3.4	0.001	0.5	*	Ethyl	Esso	RMDL
17	Ethylbenzene	0.6	ug/L	58.4	0.011	58.4	0.011	58.4	0.011	0.6	*	Ethyl	Ethyl	RMDL
17	Styrene	0.5	ug/L	58.4	0.011	58.4	0.011	58.4	0.011	0.5	*	Ethyl	Ethyl	RMDL
17	Toluene	0.5	ug/L	452.5	0.090	452.5	0.090	5.4	0.001	0.5	*	Ethyl	Esso	RMDL
17	m-Xylene and p-Xylene	1.1	ug/L	88.5	0.015	88.5	0.015	5.0	0.001	1.1	*	Ethyl	Esso	RMDL
17	o-Xylene	0.5	ug/L	65.3	0.012	65.3	0.012	2.6	0.001	0.5	*	Ethyl	Esso	RMDL
19	1-Methylnaphthalene	3.2	ug/L	2.2	*	2.2	*	2.2	*	2.2	*	Ethyl	Ethyl	RMDL
19	2-Methylnaphthalene	2.2	ug/L	1.5	*	1.5	*	1.5	*	1.5	*	Ethyl	Ethyl	RMDL
19	Acenaphthene	1.3	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	Ethyl	Ethyl	RMDL
19	Benzylbutylphthalate	0.6	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Ethyl	Ethyl	RMDL
19	Biphenyl	0.6	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Ethyl	Ethyl	RMDL
19	Fluorene	1.7	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Ethyl	Ethyl	RMDL
19	Indole	1.9	ug/L	1.2	*	1.2	*	1.2	*	1.2	*	Ethyl	Ethyl	RMDL
19	Naphthalene	1.6	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Ethyl	Ethyl	RMDL
19	Phenanthrene	0.4	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Ethyl	Ethyl	RMDL
20	Phenol	2.4	ug/L	1.1	*	1.1	*	1.1	*	1.1	*	Ethyl	Ethyl	RMDL
20	m-Cresol	3.4	ug/L	3.0	0.001	3.0	0.001	3.0	0.001	3.0	0.001	Ethyl	Ethyl	RMDL
20	o-Cresol	3.7	ug/L	1.7	*	1.7	*	1.7	*	1.7	*	Ethyl	Ethyl	RMDL
20	p-Cresol	3.5	ug/L	3.5	0.001	3.5	0.001	3.5	0.001	3.5	0.001	Ethyl	Ethyl	RMDL
25	Oil and grease	1.0	mg/L	8.9	2.026	8.9	2.026	4.1	0.849	1	2.026	Ethyl	Amoco	RMDL

* - Less than 1 gram per day

NOTE: RMDL is used in BAT Option 3 to project the effect of evaporation installed at CO 0100; BAT Option 2 technology would not be installed if BAT Option 3 is chosen for CO 0100.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ETHYL CANADA INC. - CORUNNA

CONTROL POINT - PR 0300 TEL Process Effluent flows into CO 0100
AVERAGE FLOWRATE = 590 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	2200	1479.500	2200	1479 500	31	1479.500	10	5.900	Ethyl	Esso	RMDL
2	Cyanide Total	0.005	mg/L	0 001	0.001	0.001	0.001	0.001	0.001	0 001	0.001	Ethyl	Ethyl	Ethyl
4	Ammonia plus Ammonium	0.25	mg/L	0.69	0.435	0.69	0.435	0.69	0.435	0.25	0.148	Ethyl	Ethyl	RMDL
4	Nitrate+Nitrite	0.25	mg/L	0.29	0.193	0.29	0.193	0.29	0.193	0.25	0.148	Ethyl	Ethyl	RMDL
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.1	0.642	1.1	0.642	1.1	0.642	0.5	0.295	Ethyl	Ethyl	RMDL
5	DOC	0.5	mg/L	20.1	14.517	20.1	14.517	4.4	14.517	0.5	0.295	Ethyl	Esso	RMDL
5	TOC	5	mg/L	22	16 617	22	16.617	5	16.617	5	2.950	Ethyl	Esso	RMDL
6	Total phosphorus	0.10	mg/L	0.18	0.214	0.18	0.214	0.18	0.214	0.1	0.059	Ethyl	Ethyl	RMDL
8	Total suspended solids	5	mg/L	51	39 226	51	39.226	10	39.226	5	2.950	Ethyl	Ethyl P	RMDL
8	Volatile suspended solids	10	mg/L	7	4.166	7	4.166	7	4.166	7	4.166	Ethyl	Ethyl	Ethyl
9	Aluminum	30.0	ug/L	20128.8	14.085	20128.8	14.085	5800	3.422	30	0.018	Ethyl	RREL	RMDL
9	Boron	50.0	ug/L	2650.0	2.173	2650.0	2.173	2650.0	2.173	50	0.030	Ethyl	Ethyl	RMDL
9	Chromium	20.0	ug/L	5.7	0.004	5.7	0.004	5.7	0.004	5.7	0.004	Ethyl	Ethyl	Ethyl
9	Copper	10.0	ug/L	5.3	0 004	5.3	0.004	5.3	0.004	5.3	0.004	Ethyl	Ethyl	Ethyl
9	Lead	30.0	ug/L	16710.2	11.716	16710.2	11.716	3801.0	2 243	30	0.018	Ethyl	Ethyl P	RMDL
9	Nickel	20.0	ug/L	9.4	0.008	9.4	0.008	9.4	0.008	9.4	0.008	Ethyl	Ethyl	Ethyl
9	Thallium	30.0	ug/L	18.6	0.018	18.5	0.018	18.6	0.018	18.6	0.018	Ethyl	Ethyl	Ethyl
9	Zinc	10.0	ug/L	52.8	0.036	52.8	0.036	52.8	0.036	10	0.006	Ethyl	Ethyl	RMDL
12	Mercury	0.10	ug/L	0.36	•	0.36	•	0.36	•	0.1	•	Ethyl	Ethyl	RMDL
13	Tetra-alkyl lead (Total)	2.0	ug/L	262.6	0.186	262.6	0.186	10.0	0.006	2	0.001	Ethyl	Ethyl P	RMDL
13	Tri-alkyl lead (Total)	2.0	ug/L	405.4	0.254	405.4	0.254	265.0	0.156	2	0.001	Ethyl	Ethyl P	RMDL
14	Phenolics (4AAP)	2.0	ug/L	176.6	0.099	176.6	0.099	2.5	0.001	2	0.001	Ethyl	Esso	RMDL
15	Sulphide	20.0	ug/L	137.5	0.085	137.5	0.085	137.5	0.085	20	0.012	Ethyl	Ethyl	RMDL
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	5.8	0.006	5.8	0.006	5.8	0.006	4.3	0.003	Ethyl	Ethyl	RMDL
16	1,1,2-Trichloroethane	0.6	ug/L	10.1	0.010	10.1	0.010	10.1	0.010	0.6	•	Ethyl	Ethyl	RMDL
16	1,1-Dichloroethane	0.8	ug/L	9.3	0.009	9.3	0.009	9.3	0.009	0.8	•	Ethyl	Ethyl	RMDL
16	1,1-Dichloroethylene	2.8	ug/L	12.6	0.012	12.6	0.012	12.6	0.012	2.8	0.002	Ethyl	Ethyl	RMDL
16	1,2-Dichlorobenzene	1.4	ug/L	6.9	0.007	6.9	0.007	6.9	0.007	1.4	0.001	Ethyl	Ethyl	RMDL
16	1,2-Dichloroethane	0.8	ug/L	2475.7	2 073	2475.7	2.073	73.3	0.043	0.8	•	Ethyl	913P	RMDL
16	1,2-Dichloropropane	0.9	ug/L	9.7	0.010	9.7	0.010	9.7	0.010	0.9	0.001	Ethyl	Ethyl	RMDL
16	1,3-Dichlorobenzene	1.1	ug/L	5.4	0.005	5.4	0.005	5.4	0.005	1.1	0.001	Ethyl	Ethyl	RMDL
16	1,4-Dichlorobenzene	1.7	ug/L	3.9	0.004	3.9	0.004	3.9	0.004	1.7	0.001	Ethyl	Ethyl	RMDL
16	Bromodichloromethane	0.8	ug/L	16.5	0.018	16.5	0.018	0.4	•	0.8	•	Ethyl	Esso	RMDL
16	Bromoform	3.7	ug/L	5.5	0.006	5.5	0.006	5.5	0 006	3.7	0.002	Ethyl	Ethyl	RMDL
16	Bromomethane	3.7	ug/L	46.7	0.048	46.7	0.048	46.7	0.048	3.7	0.002	Ethyl	Ethyl	RMDL
16	Carbon tetrachloride	1.3	ug/L	5.2	0.005	5.2	0.005	5.2	0.005	1.3	0.001	Ethyl	Ethyl	RMDL
16	Chlorobenzene	0.7	ug/L	10.4	0.011	10.4	0 011	10.4	0.011	0.7	•	Ethyl	Ethyl	RMDL
16	Chloroform	0.7	ug/L	24.9	0.025	24.9	0.025	1.2	0.001	0.7	•	Ethyl	Esso	RMDL

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ETHYL CANADA INC. - CORUNNA

CONTROL POINT - PR 0300 TEL Process Effluent flows into CO 0100
AVERAGE FLOWRATE = 590 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Chloromethane	3.7	ug/L	239.7	0 184	239.7	0 184	ND(50)	0.030	3 7	0.002	Ethyl	725T	RMDL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	12.1	0.013	12.1	0.013	12.1	0.013	1.4	0.001	Ethyl	Ethyl	RMDL
16	Dibromochloromethane	1.1	ug/L	7.2	0.007	7.2	0.007	7.2	0.007	1.1	0.001	Ethyl	Ethyl	RMDL
16	Ethylene dibromide	1.0	ug/L	79.9	0.057	79.9	0.057	79.9	0.057	1	0.001	Ethyl	Ethyl	RMDL
16	Methylene chloride	1.3	ug/L	554.2	0.368	554.2	0.368	ND(10)	0.006	1.3	0.001	Ethyl	913P	RMDL
16	Tetrachloroethylene	1.1	ug/L	3.6	0.004	3.6	0.004	2.1	0.001	1.1	0.001	Ethyl	Esso	RMDL
16	Trans-1,2-Dichloroethylene	1.4	ug/L	7.2	0.007	7.2	0.007	7.2	0.007	1.4	0.001	Ethyl	Ethyl	RMDL
16	Trans-1,3-Dichloropropylene	1.4	ug/L	19.0	0.020	19.0	0.020	19.0	0.020	1.4	0.001	Ethyl	Ethyl	RMDL
16	Trichloroethylene	1.9	ug/L	5.2	0.005	5.2	0.005	5.2	0.005	1.9	0.001	Ethyl	Ethyl	RMDL
16	Trichlorofluoromethane	1.0	ug/L	5.2	0.005	5.2	0.005	5.2	0.005	1	0.001	Ethyl	Ethyl	RMDL
16	Vinyl chloride	4.0	ug/L	84.8	0.070	84.8	0.070	2.6	0.002	4	0.002	Ethyl	Esso	RMDL
17	Benzene	0.5	ug/L	10.0	0.011	10.0	0.011	3.4	0.002	0.5	*	Ethyl	Esso	RMDL
17	Ethylbenzene	0.6	ug/L	6.4	0.006	6.4	0.006	6.4	0.006	0.6	*	Ethyl	Ethyl	RMDL
17	Styrene	0.5	ug/L	6.4	0.006	6.4	0.006	6.4	0.006	0.5	*	Ethyl	Ethyl	RMDL
17	Toluene	0.5	ug/L	325.1	0.304	325.1	0.304	5.4	0.003	0.5	*	Ethyl	Esso	RMDL
17	m-Xylene and p-Xylene	1.1	ug/L	8.4	0.009	8.4	0.009	5 0	0.003	1.1	0.001	Ethyl	Esso	RMDL
17	o-Xylene	0.5	ug/L	7.3	0.007	7.3	0.007	2.6	0.002	0.5	*	Ethyl	Esso	RMDL
19	1-Methylnaphthalene	3.2	ug/L	17.5	0.014	17.5	0.014	17.5	0.014	3.2	0.002	Ethyl	Ethyl	RMDL
19	2-Methylnaphthalene	2.2	ug/L	11.4	0.010	11.4	0.010	11.4	0.010	2.2	0.001	Ethyl	Ethyl	RMDL
19	Acenaphthene	1.3	ug/L	9.5	0.008	9.5	0.008	9.5	0.008	1.3	0.001	Ethyl	Ethyl	RMDL
19	Benzylbutylphthalate	0.6	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Ethyl	Ethyl	Ethyl
19	Biphenyl	0.6	ug/L	5.2	0.004	5.2	0.004	5.2	0.004	0.6	*	Ethyl	Ethyl	RMDL
19	Fluorene	1.7	ug/L	5.6	0.005	5.6	0.005	5.6	0.005	1.7	0.001	Ethyl	Ethyl	RMDL
19	Indole	1.9	ug/L	437.0	0.352	437.0	0.352	437.0	0.352	1.9	0.001	Ethyl	Ethyl	RMDL
19	Naphthalene	1.6	ug/L	5.8	0.004	5.8	0.004	5.8	0.004	1.6	0.001	Ethyl	Ethyl	RMDL
19	Phenanthrene	0.4	ug/L	4.1	0.003	4.1	0.003	4.1	0.003	0.4	*	Ethyl	Ethyl	RMDL
20	Phenol	2.4	ug/L	36.0	0.022	36.0	0.022	36.0	0.022	2.4	0.001	Ethyl	Ethyl	RMDL
20	m-Cresol	3.4	ug/L	5.5	0.004	5.5	0.004	5.5	0.004	3.4	0.002	Ethyl	Ethyl	RMDL
20	o-Cresol	3.7	ug/L	5.1	0.003	5.1	0.003	5.1	0.003	3.7	0.002	Ethyl	Ethyl	RMDL
20	p-Cresol	3.5	ug/L	5.6	0.004	5.6	0.004	5.6	0.004	3.5	0.002	Ethyl	Ethyl	RMDL
25	Oil and grease	1.0	mg/L	5.9	4.702	5.9	4.702	5.9	4.702	1	0.001	Ethyl	Ethyl	RMDL

* - Less than 1 gram per day

NOTE: RMDL is used to project the effect of installing evaporation at CO 0100; BAT Option 2 technology would not be installed if BAT Option 3 is chosen for CO 0100.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ETHYL CANADA INC. - CORUNNA

CONTROL POINT - CO 0100 Final Effluent to River
AVERAGE FLOWRATE = 31080 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AV. RAGE CONC	BAT OPTION 3 ANNUAL AV. RAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	22	818.070	22	818.070	22	818.070	10	310.800	Ethyl	Ethyl	RMDL
2	Cyanide Total	0.005	mg/L	0.001	0.035	0.001	0.035	0.001	0.035	0.001	0.035	Ethyl	Ethyl	Ethyl
4	Ammonia plus Ammonium	0.25	mg/L	0.32	11.720	0.32	11.720	0.32	11.720	0.25	7.770	Ethyl	Ethyl	RMDL
4	Nitrate+Nitrite	0.25	mg/L	0.49	16.300	0.49	16.300	0.49	16.300	0.25	7.770	Ethyl	Ethyl	RMDL
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.0	35.661	1.0	35.661	1.0	35.661	0.5	15.540	Ethyl	Ethyl	RMDL
5	DOC	0.5	mg/L	2.1	66.288	2.1	66.288	2.1	66.288	0.5	15.540	Ethyl	Ethyl	RMDL
5	TOC	5	mg/L	3	85.809	3	85.809	3	85.809	3	85.809	Ethyl	Ethyl	Ethyl
6	Total phosphorus	0.10	mg/L	0.20	6.238	0.20	6.238	0.20	6.238	0.1	3.108	Ethyl	Ethyl	RMDL
8	Total suspended solids	5	mg/L	12	385.470	12	385.470	12	385.470	5	155.400	Ethyl	Ethyl	Ethyl
8	Volatile suspended solids	10	mg/L	8	282.542	8	282.542	8	282.542	8	282.542	Ethyl	Ethyl	RMDL
9	Aluminum	30.0	ug/L	3041.8	104.686	3041.8	104.686	3041.8	104.686	30	0.932	Ethyl	Ethyl	RMDL
9	Boron	50.0	ug/L	72.5	2.527	72.5	2.527	72.5	2.527	50	1.554	Ethyl	Ethyl	RMDL
9	Chromium	20.0	ug/L	2.7	0.097	2.7	0.097	2.7	0.097	2.7	0.097	Ethyl	Ethyl	Ethyl
9	Copper	10.0	ug/L	9.3	0.327	9.3	0.327	9.3	0.327	9.3	0.327	Ethyl	Ethyl	Ethyl
9	Lead	30.0	ug/L	381.3	12.421	381.3	12.421	381.3	12.421	30	0.932	Ethyl	Ethyl	RMDL
9	Nickel	20.0	ug/L	9.0	0.317	9.0	0.317	9.0	0.317	9.0	0.317	Ethyl	Ethyl	RMDL
9	Thallium	30.0	ug/L	10.9	0.375	10.9	0.375	10.9	0.375	10.9	0.375	Ethyl	Ethyl	RMDL
9	Zinc	10.0	ug/L	17.5	0.627	17.5	0.627	17.5	0.627	10	0.311	Ethyl	Ethyl	RMDL
12	Mercury	0.10	ug/L	0.60	0.020	0.60	0.020	0.60	0.020	0.1	0.003	Ethyl	Ethyl	RMDL
13	Tetra-alkyl lead (Total)	2.0	ug/L	4.1	0.136	4.1	0.136	4.1	0.136	2	0.062	Ethyl	Ethyl	RMDL
13	Tri-alkyl lead (Total)	2.0	ug/L	24.6	0.876	24.6	0.876	24.6	0.876	2	0.062	Ethyl	Ethyl	RMDL
14	Phenolics (4AAP)	2.0	ug/L	9.1	0.311	9.1	0.311	9.1	0.311	2	0.062	Ethyl	Ethyl	RMDL
15	Sulphide	20.0	ug/L	32.5	1.150	32.5	1.150	32.5	1.150	20.0	0.622	Ethyl	Ethyl	RMDL
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	5.8	0.176	5.8	0.176	5.8	0.176	4.3	0.134	Ethyl	Ethyl	RMDL
16	1,1,2-Trichloroethane	0.6	ug/L	10.1	0.311	10.1	0.311	10.1	0.311	0.6	0.019	Ethyl	Ethyl	RMDL
16	1,1-Dichloroethane	0.8	ug/L	128.1	4.458	128.1	4.458	128.1	4.458	0.8	0.025	Ethyl	Ethyl	RMDL
16	1,1-Dichloroethylene	2.8	ug/L	12.9	0.414	12.9	0.414	12.9	0.414	2.8	0.087	Ethyl	Ethyl	RMDL
16	1,2-Dichlorobenzene	1.4	ug/L	6.9	0.212	6.9	0.212	6.9	0.212	1.4	0.044	Ethyl	Ethyl	RMDL
16	1,2-Dichloroethane	0.8	ug/L	131.5	4.715	131.5	4.715	131.5	4.715	0.8	0.025	Ethyl	Ethyl	RMDL
16	1,2-Dichloropropane	0.9	ug/L	9.1	0.280	9.1	0.280	9.1	0.280	0.9	0.028	Ethyl	Ethyl	RMDL
16	1,3-Dichlorobenzene	1.1	ug/L	5.4	0.166	5.4	0.166	5.4	0.166	1.1	0.034	Ethyl	Ethyl	RMDL
16	1,4-Dichlorobenzene	1.7	ug/L	3.1	0.118	3.1	0.118	3.1	0.118	1.7	0.053	Ethyl	Ethyl	RMDL
16	Bromodichloromethane	0.8	ug/L	13.2	0.400	13.2	0.400	13.2	0.400	0.8	0.025	Ethyl	Ethyl	RMDL
16	Bromoform	3.7	ug/L	5.5	0.168	5.5	0.168	5.5	0.168	3.7	0.115	Ethyl	Ethyl	RMDL
16	Bromomethane	3.7	ug/L	45.4	1.378	45.4	1.378	45.4	1.378	3.7	0.115	Ethyl	Ethyl	RMDL
16	Carbon tetrachloride	1.3	ug/L	5.2	0.159	5.2	0.159	5.2	0.159	1.3	0.040	Ethyl	Ethyl	RMDL
16	Chlorobenzene	0.7	ug/L	10.4	0.318	10.4	0.318	10.4	0.318	0.7	0.022	Ethyl	Ethyl	RMDL
16	Chloroform	0.7	ug/L	40.3	1.257	40.3	1.257	40.3	1.257	0.7	0.022	Ethyl	Ethyl	RMDL

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ETHYL CANADA INC. - CORUNNA

CONTROL POINT - CO 0100 Final Effluent to River
AVERAGE FLOWRATE = 31080 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Chloromethane	3.7	ug/L	56.4	1.867	56.4	1.867	56.4	1.867	3.7	0.115	Ethyl	Ethyl	RMDL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	12.1	0.371	12.1	0.371	12.1	0.371	1.4	0.044	Ethyl	Ethyl	RMDL
16	Dibromochloromethane	1.1	ug/L	9.0	0.281	9.0	0.281	9.0	0.281	1.1	0.034	Ethyl	Ethyl	RMDL
16	Ethylene dibromide	1.0	ug/L	12.7	0.408	12.7	0.408	12.7	0.408	1.0	0.031	Ethyl	Ethyl	RMDL
16	Methylene chloride	1.3	ug/L	89.0	2.894	89.0	2.894	89.0	2.894	1.3	0.040	Ethyl	Ethyl	RMDL
16	Tetrachloroethylene	1.1	ug/L	3.7	0.113	3.7	0.113	3.7	0.113	1.1	0.034	Ethyl	Ethyl	RMDL
16	Trans-1,2-Dichloroethylene	1.4	ug/L	7.2	0.219	7.2	0.219	7.2	0.219	1.4	0.044	Ethyl	Ethyl	RMDL
16	Trans-1,3-Dichloropropylene	1.4	ug/L	19.0	0.584	19.0	0.584	19.0	0.584	1.4	0.044	Ethyl	Ethyl	RMDL
16	Trichloroethylene	1.9	ug/L	5.2	0.159	5.2	0.159	5.2	0.159	1.9	0.059	Ethyl	Ethyl	RMDL
16	Trichlorofluoromethane	1.0	ug/L	5.2	0.159	5.2	0.159	5.2	0.159	1.0	0.031	Ethyl	Ethyl	RMDL
16	Vinyl chloride	4.0	ug/L	53.8	1.680	53.8	1.680	53.8	1.680	4.0	0.124	Ethyl	Ethyl	RMDL
17	Benzene	0.5	ug/L	14.1	0.445	14.1	0.445	14.1	0.445	0.5	0.016	Ethyl	Ethyl	RMDL
17	Ethylbenzene	0.6	ug/L	6.2	0.192	6.2	0.192	6.2	0.192	0.6	0.019	Ethyl	Ethyl	RMDL
17	Styrene	0.5	ug/L	6.2	0.192	6.2	0.192	6.2	0.192	0.5	0.016	Ethyl	Ethyl	RMDL
17	Toluene	0.5	ug/L	49.7	1.651	49.7	1.651	49.7	1.651	0.5	0.016	Ethyl	Ethyl	RMDL
17	m-Xylene and p-Xylene	1.1	ug/L	8.3	0.255	8.3	0.255	8.3	0.255	1.1	0.034	Ethyl	Ethyl	RMDL
17	o-Xylene	0.5	ug/L	7.2	0.223	7.2	0.223	7.2	0.223	0.5	0.016	Ethyl	Ethyl	RMDL
19	1-Methylnaphthalene	3.2	ug/L	2.2	0.077	2.2	0.077	2.2	0.077	2.2	0.068	Ethyl	Ethyl	Ethyl
19	2-Methylnaphthalene	2.2	ug/L	1.5	0.053	1.5	0.053	1.5	0.053	1.5	0.047	Ethyl	Ethyl	Ethyl
19	Acenaphthene	1.3	ug/L	0.7	0.025	0.7	0.025	0.7	0.025	0.7	0.022	Ethyl	Ethyl	Ethyl
19	Benzylbutylphthalate	0.6	ug/L	0.6	0.021	0.6	0.021	0.6	0.021	0.6	0.019	Ethyl	Ethyl	RMDL
19	Biphenyl	0.6	ug/L	0.4	0.014	0.4	0.014	0.4	0.014	0.4	0.012	Ethyl	Ethyl	Ethyl
19	Fluorene	1.7	ug/L	0.3	0.011	0.3	0.011	0.3	0.011	0.3	0.009	Ethyl	Ethyl	Ethyl
19	Indole	1.9	ug/L	7.5	0.260	7.5	0.260	7.5	0.260	1.9	0.059	Ethyl	Ethyl	RMDL
19	Naphthalene	1.6	ug/L	0.3	0.011	0.3	0.011	0.3	0.011	0.3	0.009	Ethyl	Ethyl	Ethyl
19	Phenanthrene	0.4	ug/L	0.3	0.011	0.3	0.011	0.3	0.011	0.3	0.009	Ethyl	Ethyl	Ethyl
20	Phenol	2.4	ug/L	1.1	0.038	1.1	0.038	1.1	0.038	1.1	0.034	Ethyl	Ethyl	Ethyl
20	m-Cresol	3.4	ug/L	3.0	0.103	3.0	0.103	3.0	0.103	3.0	0.093	Ethyl	Ethyl	Ethyl
20	o-Cresol	3.7	ug/L	1.7	0.059	1.7	0.059	1.7	0.059	1.7	0.053	Ethyl	Ethyl	Ethyl
20	p-Cresol	3.5	ug/L	3.5	0.120	3.5	0.120	3.5	0.120	3.5	0.109	Ethyl	Ethyl	RMDL
25	Oil and grease	1.0	mg/L	1.3	42.780	1.3	42.780	1.3	42.780	1.0	0.031	Ethyl	Ethyl	RMDL

NOTE: RMDL is used to project the effect of installing evaporation at CO 0100; BAT Option 2 technology would not be installed if BAT Option 3 is chosen for CO 0100.

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

G.E. PLASTICS CANADA LTD.

1.0 PLANT DESCRIPTION

The G.E. Plastics Canada Ltd., plant located at Cobourg on the shore of Lake Ontario was reacting acrylonitrile, styrene and polybutadiene latex with peroxide initiators to produce ABS resins and intermediate latex during the monitoring period. A subsequent operation compounds dry resins with a variety of pigments and additives to produce coloured pellets. ABS resins have a wide range of applications including telephones, drain pipes, automobile trim, hand tools and computer housings. Since April 1992, operations have been downsized with the site no longer producing ABS resin but importing it for compounding.

G.E. Plastics has an end-of-pipe wastewater treatment system which consists of oil separation, primary settling, neutralization, equalization, primary clarification, activated sludge, secondary clarification and sand filtration. The dual sand filters were not installed until June 1990, so that monitoring data collected after that date reflect the actual performance of the technology. Contaminated cooling and storm water as well as yard runoff are passed through the biological treatment plant which discharges through a submerged outfall into Lake Ontario at MISA Control Point CO 0100.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Wastewater including once-through cooling water and stormwater generated at the plant is collected for treatment and subsequent discharge in four different sewers:

- sanitary sewers
- process sewers
- stormwater sewers
- once-through cooling water sewers

Once-through, non-contact cooling water is collected and stored for reuse in the latex coagulation tank or as wash water in the filter dewatering system in the ABS resin manufacturing line or to cool the extruder vacuum pump. Once reused, this cooling water is treated as process wastewater and is discharged to the wastewater treatment system. Overflow from cooling water storage tank is being discharged directly to Lake Ontario through MISA Control Point OT 0400.

Stormwater runoff collected from roof tops and from the asphalt areas in the south portion of the plant is being discharged directly to Lake Ontario through two discharge points (MISA Control Point ST 0200 and ST 0300). Monitoring data were collected at ST 0200 and ST 0300 during the MISA Twelve Month Monitonng Penod. Stormwater runoff from within the plant processes and spill contaminant areas is directed to the wastewater treatment system.

The sanitary wastewater is discharged to the municipal water treatment plant.

All wastewater resulting from process effluent, boiler blowdown, purging of pumps, reactor cleaning between batches, and contact cooling water used to cool the extruded ABS strands is discharged to the plant's wastewater treatment system. MISA Control Point CO 0100 represents the effluent of the wastewater treatment plant to Lake Ontario.

Table 1.0 presents a summary of wastewater sources at G.E. Plastics.

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report at MISA Control Points OT 0400 and CO 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Table 1.0 Wastewater Sources at G.E. Plastics, Cobourg		
Source	**Type**	**Destination**
Resin Manufacturing Line*		
Resin area reactor jackets Latex feed pump gland jacket Latex reactor jacket	Once-through non-contact cooling water	· Stored for secondary use · May be mixed with process wastewater in latex coagulation tank or used in dewatering filter system · Overflow from storage is discharged to Lake Ontario
Washwater within plant	Process water	· Wastewater treatment facility
Spills within plant	Spill	· Wastewater treatment facility
Dewatering filter system	Process water	· Wastewater treatment facility
Pellet Manufacturing		
Henschel jacket Feed throat jacket to extruder feed section Extruder cooling jackets Dynomatic extruder speed control unit	Once-through non-contact cooling water	· Stored for secondary use · May be mixed with process wastewater in latex coagulation tank, or used in the dewatering filter system · Overflow from storage is discharged to Lake Ontario
Pellet cooling bath on-line with extruder	Contact cooling water	· Wastewater treatment facility
Extruder vacuum	Process water	· Oil/water gravity separator · Separator overflow to waste-water treatment facility · Oil disposed by Laidlaw
Other Facilities		
Boiler**	Boiler blowdown	· Directly to the aeration basins of the wastewater treatment facility
Water softener and Demineralizer	Water softener regeneration wastewater	· Directly to the aeration basins of the wastewater treatment facility
Spill containment areas, bulk storage and transfer areas	Spill	· Wastewater treatment facility
Lexan sheet plant***	Contact cooling water	· Wastewater treatment facility

*The sources of wastewater listed under this section no longer exist since the shutdown of resin manufacturing in April 1992.
**Operations downsized - 2 boilers used in winter (originally 5) and none used in summer.
***Operations began during the summer of 1991.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options is addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period for MISA Control Points OT 0400 and CO 0100 were determined to be acutely lethal to Rainbow Trout. An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity Unit for MISA Control Point CO 0100 indicated that high concentrations of cyanide and ammonia were measured in the effluent when the lethality occurred (Ref. 2). However, it is not clear that high concentrations of ammonia and cyanide are the sole cause of the observed lethality since the cooling water effluent (MISA Control Point OT 0400) was also determined to be lethal. Ammonia and cyanide concentrations were not high when the lethality occurred at MISA Control Point OT 0400.

Based on these results, a Toxicity Investigation Evaluation (TIE) study and/or an evaluation of the effect of plant downsizing on acute toxicity is recommended for MISA Control Points OT 0400 and CO 0100 to assess the cause of the toxicity problems identified. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 3).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction.

3.2.1 Clarifier Effluent (MISA Control Point CO 0100)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report showed elevated concentrations of some conventional pollutants for the clarifier effluent (MISA Control Point CO 0100). Relatively high levels of COD (56 mg/l), DOC (16.5 mg/l), TOC (29 mg/l), ammonia (20.12 mg/l), nitrates (24.21 mg/l), and total kjeldahl nitrogen (24.4 mg/l) were found in the effluent during the MISA Monitoring Program. Upgrades of the existing biological treatment system are the recommended method of control for the above-mentioned pollutants for BAT Option 2. Methods by which biological treatment systems in the OCPSF industry may modify their existing facilities to upgrade and improve performance include adding unit treatment processes, modifying the design and operational parameters of existing units, acclimating existing bacteria to certain toxicants and nutrient addition (Ref. 4).

A report published by the Water Pollution Control Federation also provides guidelines on how to modify design and operational parameters in activated sludge systems to control ammonia effluent concentrations (Ref. 5).

3.2.2 Cooling Water Effluent (MISA Control Point OT 0400)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for the cooling water effluent (MISA Control Point OT 0400) indicates that the plant's current pollutant discharge levels are as low or lower than discharge levels at similar organic chemical manufacturing plants in the U.S. and Ontario with the exception of phenolics (4AAP). The average effluent concentration of phenolics (4AAP) was 4710.4 ug/l. The recommendation of any technologies for the reduction of phenolics at MISA Control Point OT 0400 is not going to be cost effective since only a very small quantity of flow resulting from the cooling water storage tank overflow is currently being discharged. The average flow at MISA Control Point OT 0400 was only 126 m^3/day as obtained from the MISA OCM Sector Twelve Month Report. Since the flow is very low, it is recommended that this wastestream should be routed to the plant's biological treatment system. Alternatively, BMPs may be investigated to eliminate the phenolics contamination. During the period of the MISA Monitoring Program, the biological treatment system achieves a phenolics concentration of 43.3 ug/l and with the upgrades recommended under BAT Option 2, it is expected that the effluent concentration for phenolics (4AAP) will be further reduced.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminant, including current technologies or combination of current technologies including supplemental/add-on technologies or cross-over technologies from other industrial sectors. Based on the contaminants present in the plant effluents, granular activated carbon and multimedia filtration are recommended for MISA Control Point CO 0100. Since the cooling water effluent (OT 0400) is recommended to be directed into the existing biological treatment system as part of BAT Option 2, no additional treatment is recommended for BAT Option 2.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT options recommended for G.E. Plastics, for MISA Control Points OT 0400 and CO 0100.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR G.E. PLASTICS LTD.

BAT OPTION	DEFINITION	DESCRIPTION
A. MISA CONTROL POINT CO 0100 (Clarifier Effluent to Lake)		
1	Non-lethal effluent	· Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Biological Treatment Upgrades
3	Zero Discharge/Virtual Elimination	· Granular Activated Carbon · Multimedia Filtration
B. MISA CONTROL POINT OT 0400 (Cooling Water Effluent to Lake)		
1	Non-lethal effluent	· Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Route stream to existing biological treatment system (or BMP to eliminate phenolics)
3	Zero Discharge/Virtual Elimination	· No additional treatment

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT options. MISA Monitoring Program performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included

in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for G.E. Plastics Canada Ltd. Plant were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 4).

Table 3.0 presents the cost estimates for the technologies selected for each BAT option for G.E. Plastics. The cost estimates generated are for granular activated carbon, biological treatment upgrades and multimedia filtration at MISA Control Point CO 0100. Cost estimates for development and implementation of a TIE Study for MISA Control Points CO 0100 and OT 0400 could not be developed due to the site-specific nature of the study.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
G.E. PLASTICS CANADA LTD.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
OT 0400	119	NA	NA	TIE	NA	NA	ROUTE TO EXISTING BIOX	0	0	NAT
CO 0100	2,148	NA	NA	TIE	141,600	10,000	BTU	141,600	10,000	OPTION 2
								766,700	66,200	FIL
								6,732,800	376,300	GAC
								7,641,100	452,500	TOTAL

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
BTU - Biological Treatment Upgrades
FIL - Multimedia Filtration
NA - Cost Estimates Not Developed
TIE - Toxicity Investigation Evaluation

A cost estimate for the rerouting of the cooling water effluent stream to the end-of-pipe treatment system (MISA Control Point OT 0400) could not be developed due to the site-specific nature of this estimate.

6.0 REFERENCES

1. G.E. Plastics Canada Ltd. - BAT Status of OCM Sector Plants Site Visit Information Report, March 17, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirier, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

5. R.J. Kukenberger, D.R. Ohman, J.R. Blasland, D.P. Morgan and R.A. White; "Three Steps to Consistent Nitrification", WPCF Vol. 8, No. 11, November 1991 pg. 22-27.

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR
G.E. PLASTICS CANADA LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – G.E. PLASTICS CANADA LTD. – COBOURG

ATG	PARAMETER	RMDL	UNIT	IN 0600	CO 0100	OT 0400
1	COD	10	mg/L	9	56	–
2	Cyanide Total	0.005	mg/L	0.002	0.088	0.003
3	Hydrogen ion (pH)			–	7.8	7.7
4	Ammonia plus Ammonium	0.25	mg/L	–	20.18	5.45
4	Nitrate+Nitrite	0.25	mg/L	–	24.41	2.01
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	24.4	9.8
5	DOC	0.5	mg/L	–	16.5	10.6
5	TOC	5	mg/L	3	29	9
6	Total phosphorus	0.10	mg/L	0.06	0.51	0.81
7	Specific conductance	5	uS/cm	–	2303	532
8	Total suspended solids	5	mg/L	–	26	9
8	Volatile suspended solids	10	mg/L	–	23	–
9	Aluminum	30.0	ug/L	106.0	235.9	94.3
9	Cadmium	2.0	ug/L	1.2	1.4	2.2
9	Zinc	10.0	ug/L	24.0	10.3	47.8
10	Antimony	5.0	ug/L	2.8	62.5	14.4
12	Mercury	0.10	ug/L	0.04	0.05	0.16
14	Phenolics (4AAP)	2.0	ug/L	2.2	43.3	4710.4
15	Sulphide	20.0	ug/L	19.5	120.0	–
17	o–Xylene	0.5	ug/L	0.4	0.5	0.4
25	Oil and grease	1.0	mg/L	1.2	2.5	3.5
98	Ftflow		m3/day	1680	1787	126

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation

(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS:
IN 0600 – Intake Water to Site
CO 0100 – Clarifier Effluent to Lake
OT 0400 – Cooling Water to Lake

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – GE PLASTICS CANADA LTD. – COBOURG

ATG	PARAMETER	IN 0600	CO 0100	OT 0400	TOTAL
1	COD	17.411	129.646	–	129.646
2	Cyanide Total	0.004	0.157	*	0.157
4	Ammonia plus Ammonium	–	37.526	0.132	37.658
4	Nitrate+Nitrite	–	40.471	0.052	40.523
4	Total Kjeldahl Nitrogen	–	44.730	0.236	44.966
5	DOC	–	29.176	1.893	31.069
5	TOC	6.075	48.197	0.982	49.179
6	Total phosphorus	0.113	0.837	0.009	0.846
8	Total suspended solids	–	43.171	0.847	44.018
8	Volatile suspended solids	–	41.349	–	41.349
9	Aluminum	0.203	0.380	0.012	0.392
9	Cadmium	0.002	0.002	*	0.002
9	Zinc	0.046	0.018	0.002	0.020
10	Antimony	0.005	0.107	0.001	0.108
12	Mercury	*	*	*	*
14	Phenolics (4AAP)	0.004	0.074	0.056	0.130
15	Sulphide	0.037	0.256	–	0.256
17	o–Xylene	0.001	0.001	*	0.001
25	Oil and grease	2.223	4.435	0.208	4.643

EXPLANATORY NOTES:

(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:

IN 0600 – Intake Water to Site
CO 0100 – Clarifier Effluent to Lake
OT 0400 – Cooling Water to Lake

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
G.E. PLASTICS CANADA LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - GE PLASTICS CANADA LTD. - COBOURG

CONTROL POINT - CO 0100 Clarifier Effluent to Lake
AVERAGE FLOWRATE = 1787 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	56	129.646	56	129.646	56.0	129.646	31	55.397	GE	GE	Esso
2	Cyanide Total	0.005	mg/L	0.088	0.157	0.088	0.157	0.088	0.157	0.088	0.157	GE	GE	GE
4	Ammonia plus Ammonium	0.25	mg/L	20.18	37.526	20.18	37.526	1.57	2.806	1.57	2.806	GE	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	24.41	40.471	24.41	40.471	2.15	3.842	2.15	3.842	GE	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	24.4	44.730	24.4	44.730	2.3	4.110	2.3	4.110	GE	Polysar	Polysar
5	DOC	0.5	mg/L	16.5	29.176	16.5	29.176	16.5	29.176	4.4	7.863	GE	GE	Esso
5	TOC	5	mg/L	29	48.197	29	48.197	15	26.805	5	8.935	GE	Polysar	Esso
6	Total phosphorus	0.10	mg/L	0.51	0.837	0.51	0.837	0.51	0.837	0.51	0.837	GE	GE	GE
8	Total suspended solids	5	mg/L	26	43.171	26	43.171	15	26.805	5	8.935	GE	Polysar	P1774
8	Volatile suspended solids	10	mg/L	23	41.349	23	41.349	15	26.805	5	8.935	GE	Polysar	P1774
9	Aluminum	30.0	ug/L	235.9	0.380	235.9	0.380	235.9	0.380	235.9	0.380	GE	GE	GE
9	Cadmium	2.0	ug/L	1.4	0.002	1.4	0.002	1.4	0.002	1.4	0.002	GE	GE	GE
9	Zinc	10.0	ug/L	10.3	0.018	10.3	0.018	10.3	0.018	10.3	0.018	GE	GE	GE
10	Antimony	5.0	ug/L	62.5	0.107	62.5	0.107	62.5	0.107	62.5	0.107	GE	GE	GE
12	Mercury	0.10	ug/L	0.05	*	0.05	*	0.05	*	0.05	*	GE	GE	GE
14	Phenolics (4AAP)	2.0	ug/L	43.3	0.074	43.3	0.074	10.1	0.018	2.5	0.004	GE	Polysar	Esso
15	Sulphide	20.0	ug/L	120.0	0.256	120.0	0.256	120.0	0.256	120.0	0.256	GE	GE	GE
17	o-Xylene	0.5	ug/L	0.5	0.001	0.5	0.001	0.5	0.001	0.5	0.001	GE	GE	GE
25	Oil and grease	1.0	mg/L	2.5	4.435	2.5	4.435	2.5	4.435	2.5	4.435	GE	GE	GE

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - GE PLASTICS CANADA LTD. - COBOURG

CONTROL POINT - OT 0400 Cooling Water to Lake
AVERAGE FLOWRATE = 126 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	0.003	*	0.003	*	0.003	*	0.003	*	GE	GE	GE
4	Ammonia plus Ammonium	0.25	mg/L	5.45	0.132	5.45	0.132	1.57	0.198	1.57	0.198	GE	Polysar^	Polysar^
4	Nitrate+Nitrite	0.25	mg/L	2.01	0.052	2.01	0.052	2.01	0.052	2.01	0.052	GE	GE	GE
4	Total Kjeldahl Nitrogen	0.5	mg/L	9.8	0.236	9.8	0.236	2.3	0.290	2.3	0.290	GE	Polysar^	Polysar^
5	DOC	0.5	mg/L	10.6	1.893	10.6	1.893	10.6	1.893	4.4	0.554	GE	GE	Esso
5	TOC	5	mg/L	9	0.982	9	0.982	9	0.982	5	0.630	GE	GE	Esso
6	Total phosphorus	0.10	mg/L	0.81	0.009	0.81	0.009	0.71	0.089	0.71	0.089	GE	Polysar^	Polysar^
8	Total suspended solids	5	mg/L	9	0.847	9	0.847	9	0.847	5	0.630	GE	GE	P1774
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	94.3	0.012	94.3	0.012	94.3	0.012	94.3	0.012	GE	GE	GE
9	Cadmium	2.0	ug/L	2.2	*	2.2	*	2.2	*	2.2	*	GE	GE	GE
9	Zinc	10.0	ug/L	47.8	0.002	47.8	0.002	47.8	0.002	47.8	0.002	GE	GE	GE
10	Antimony	5.0	ug/L	14.4	0.001	14.4	0.001	14.4	0.001	14.4	0.001	GE	GE	GE
12	Mercury	0.10	ug/L	0.16	*	0.16	*	0.16	*	0.16	*	GE	GE	GE
14	Phenolics (4AAP)	2.0	ug/L	4710.4	0.056	4710.4	0.056	10.1	0.001	2.5	*	GE	Polysar	Esso
15	Sulphide	20.0	ug/L	-	-	-	-	-	-	-	-			
17	o-Xylene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	GE	GE	GE
25	Oil and grease	1.0	mg/L	3.5	0.208	3.5	0.208	3.5	0.208	3.5	0.208	GE	GE	GE

^ - Revised BAT loadings based on average flow; therefore, projected loadings may be higher than actual loadings.

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

GUARDSMAN PRODUCTS LTD.

1.0 PLANT DESCRIPTION

Guardsman Products Ltd. in Cornwall manufactures batch-type operation stains, sealers and topcoats for the furniture industry; finish coatings for the paper converting industry and unsaturated polyester and alkyd resins.

About 134 people are employed at the Cornwall plant. Under normal conditions, the plant operates 16 hours per day in two shifts for 260 days per year (5 day week).

The plant is located north of the St. Lawrence River west of Cornwall on Highway 2. The plant property does not extend to the river. Effluent from the plant, however, is discharged to a southeast drain which flows to the St. Lawrence River. The north end of the property runs into a marsh area which drains along the east side of the property, eventually reaching the southeast discharge drain. The southeast drain to the St. Lawrence River is the only MISA sampling location (OT 0100).

Details on the plant processes, water uses and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

There is only one sampling location at the southeast drain; this drain is listed as MISA Control Point OT 0100. OT 0100 is an open ditch receiving cooling water from the coating building and a very small amount of boiler blowdown. Wastewater from the other areas of the plant is discharged to the municipal sanitary sewer.

Table 1.0 summarizes the wastewater generating areas discharging to MISA Control Point OT 0100.

TABLE 1.0 MISA MONITORED DISCHARGES AT GUARDSMAN	
Monitoring Location	Contributing Process/Generating Areas
OT 0100	Coating Grinders (OTCW) Coatings Mixer (OTCW) Coatings Boiler Roof Top Stormwater

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results from MISA Control Point OT 0100 as obtained from the MISA OCM Sector Twelve Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period indicated that the plant's effluent was not acutely lethal. As a result, no additional treatment is recommended under this BAT option.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that, if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0100 indicate that the plant's current pollutant effluent discharge levels are as low or lower than discharge levels from similar organic manufacturing plants in the U.S. and Ontario. Therefore, no additional treatment is required under this BAT option.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. Technologies considered under this option include any current technology or combination of current technologies, including supplemental or cross-over technologies from other industrial sectors. The quality of the plant's effluent, as indicated by the draft analytical results from the MISA Twelve Month Monitoring Period, indicates that no other current technology or a combination of current technologies currently practiced under the organic manufacturing sector or any other industrial sector is required. Therefore, no additional treatment is recommended under this BAT option.

4.0 PERFORMANCE DATA FOR SELECTED OPTIONS

Since no additional treatment was recommended under any BAT option, there is no projected reduction from the current pollutant loadings. Appendix B of this report presents the current pollutant concentrations and loadings for MISA Control Point OT 0100. BAT Options 1, 2 and 3 effluent concentrations and loadings have been set equal to Guardsman's current effluent concentrations and loadings.

5.0 BAT OPTIONS COST ESTIMATES

Since no additional treatment has been recommended, no estimate of compliance costs was required for BAT Options 1, 2 and 3.

6.0 REFERENCES

1. Guardsman Products Ltd. - BAT Status Report for OCM Sector Plant Site Visit Information Report, March 21, 1991.

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR GUARDSMAN PRODUCTS, LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – GUARDSMAN PRODUCTS LTD. – CORNWALL

ATG	PARAMETER	RMDL	UNIT	IN 0400	OT 0100
1	COD	10	mg/L	–	–
2	Cyanide Total	0.005	mg/L	–	–
3	Hydrogen ion (pH)			–	6.1
4	Ammonia plus Ammonium	0.25	mg/L	–	–
4	Nitrate + Nitrite	0.25	mg/L	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	–
5	DOC	0.5	mg/L	–	4.5
5	TOC	5	mg/L	–	5
6	Total phosphorus	0.10	mg/L	–	0.12
7	Specific conductance	5	uS/cm	–	1977
8	Total suspended solids	5	mg/L	–	3
8	Volatile suspended solids	10	mg/L	–	4
9	Aluminum	30.0	ug/L	–	59.8
9	Beryllium	10.0	ug/L	–	6.2
9	Cadmium	2.0	ug/L	–	3.1
9	Copper	10.0	ug/L	–	8.8
9	Molybdenum	20.0	ug/L	–	19.2
9	Zinc	10.0	ug/L	–	20.4
17	Toluene	0.5	ug/L	–	5.2
25	Oil and grease	1.0	mg/L	–	0.9
98	Ftflow		m3/day	–	104

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation

(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the did not qualify as "found" at the site.

SAMPLING POINTS
IN 0400 – Intake Water to Site
OT 0100 – Southeast Drain to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – GUARDSMAN PRODUCTS LTD. – CORNWALL

ATG	PARAMETER	IN 0400	OT 0100	TOTAL
1	COD	–	–	–
2	Cyanide Total	–	–	–
4	Ammonia plus Ammonium	–	–	–
4	Nitrate + Nitrite	–	–	–
4	Total Kjeldahl Nitrogen	–	–	–
5	DOC	–	0.450	0.450
5	TOC	–	0.541	0.541
6	Total phosphorus	–	0.012	0.012
8	Total suspended solids	–	0.226	0.226
8	Volatile suspended solids	–	0.297	0.297
9	Aluminum	–	0.006	0.006
9	Beryllium	–	0.001	0.001
9	Cadmium	–	*	*
9	Copper	–	0.001	0.001
9	Molybdenum	–	0.002	0.002
9	Zinc	–	0.002	0.002
17	Toluene	–	*	*
25	Oil and grease	–	0.075	0.075

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS
IN 0400 – Intake Water to Site
OT 0100 – Southeast Drain to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS GUARDSMAN PRODUCTS, LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - GUARDSMAN PRODUCTS LTD. - CORNWALL

CONTROL POINT - OT 0100 Southeast Drain to River
AVERAGE FLOWRATE = 104 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV..RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate + Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	4.5	0.450	4.5	0.450	4.5	0.450	4.5	0.450	Guard	Guard	Guard
5	TOC	5	mg/L	5	0.541	5	0.541	5	0.541	5	0.541	Guard	Guard	Guard
6	Total phosphorus	0.10	mg/L	0.12	0.012	0.12	0.012	0.12	0.012	0.12	0.012	Guard	Guard	Guard
8	Total suspended solids	5	mg/L	3	0.226	3	0.226	3	0.226	3	0.226	Guard	Guard	Guard
8	Volatile suspended solids	10	mg/L	4	0.297	4	0.297	4	0.297	4	0.297	Guard	Guard	Guard
9	Aluminum	30.0	ug/L	59.8	0.006	59.8	0.006	59.8	0.006	59.8	0.006	Guard	Guard	Guard
9	Beryllium	10.0	ug/L	6.2	0.001	6.2	0.001	6.2	0.001	6.2	0.001	Guard	Guard	Guard
9	Cadmium	2.0	ug/L	3.1	*	3.1	*	3.1	*	3.1	*	Guard	Guard	Guard
9	Copper	10.0	ug/L	8.8	0.001	8.8	0.001	8.8	0.001	8.8	0.001	Guard	Guard	Guard
9	Molybdenum	20.0	ug/L	19.2	0.002	19.2	0.002	19.2	0.002	19.2	0.002	Guard	Guard	Guard
9	Zinc	10.0	ug/L	20.4	0.002	20.4	0.002	20.4	0.002	20.4	0.002	Guard	Guard	Guard
17	Toluene	0.5	ug/L	5.2	*	5.2	*	5.2	*	5.2	*	Guard	Guard	Guard
25	Oil and grease	1.0	mg/L	0.9	0.075	0.9	0.075	0.9	0.075	0.9	0.075	Guard	Guard	Guard

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

MORBERN INC.

1.0 PLANT DESCRIPTION

Morbern Inc. in Cornwall has been producing vinyl coated fabrics for 25 years. The plant manufactures approximately 45,000 square yards per day. The plant operates three 8 hr. shifts per day, 5 days per week for 238 production days a year and employs about 234 people. Morbern Inc. is situated less than a km north of the St. Lawrence River on Copeland Road.

Plant wastewater is currently discharged at a single location designated as OT 0100. Stormwater from building roof drains is also conveyed through OT 0100. Stormwater from other outside areas, such as parking lots and roadways, flows either down the slope towards Grays Creek or out the other side of the property through a culvert to a storm drainage ditch. This storm drainage ditch leads to another marsh area on the northern end of the property.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

MISA Control Point OT 0100, receives discharges of once-through, non-contact cooling water from the various processing units and stormwater. Table 1.0 summarizes the process/ generating areas discharging to MISA Control Point OT 0100.

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0100.

TABLE 1.0 MISA MONITORED DISCHARGE RATES AT MORBERN	
Monitoring Location	Contributing Process/Generating Areas
OT 0100	<u>Compounding</u> DCI unit grinders (OTCW)[1] <u>Casting</u> Casting machine (OTCW) <u>Printing</u> Presses (OTCW) <u>Embossing</u> Embossing machine (OTCW), boilers, softeners Roof top stormwater

NOTE:

1 - OTCW = Once through non-contact cooling water

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment during the MISA Twelve Month Monitoring Period indicated that the plant's effluent was not acutely lethal. As a result of that, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that, if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCMS Sector Twelve Month Report for MISA Control Point OT 0100 showed elevated concentrations of some organic pollutants and metals. The average concentrations for phenolics (4AAP), aluminum, zinc and boron were reported at 57.3 ug/l, 121.2 ug/l, 42.8 ug/l and 61.4 ug/l, respectively. Although the reported concentrations of these pollutants are not considered high for a process wastewater, since wastewater discharged to MISA Control Point OT 0100 is mostly non-contact cooling water, granular activated carbon and multimedia filtration are recommended for MISA Control Point OT 0100 to control phenolics (4AAP), aluminum, zinc and boron under this BAT Option.

A draft report prepared by Canada Environment outlines guidelines for a development and implementation of a Best Management Practices (BMP) plan (Ref. 2).

3.3 BAT OPTION 3

This option incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. Technologies considered under this option include any current technology or combination of current technologies, including supplemental or cross-over technologies from other industrial sectors. No additional technologies were identified for the removal of the projected BAT Option 2 concentrations of phenolics (4AAP), aluminum, zinc and boron present at MISA Control Point OT 0100. Therefore, BAT Option 3 is set equal to BAT Option 2.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT options recommended for this plant.

Table 2.0 Summary of BAT Option for Morbern - Cornwall MISA Control Point OT 0100		
BAT Option	Definition	Description
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Multimedia Filtration · Granular Activated Carbon
3	Zero Discharge/Virtual Elimination	Same as BAT Option 2

4.0 PERFORMANCE DATA FOR SELECTED OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and cannot be easily estimated on an industry-wide basis. The average flow rate as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Morbern Inc. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 3).

Table 3.0 presents the cost estimates for the technologies selected for each BAT option for Morbern Inc. The only cost estimates are for granular activated carbon and multimedia filtration at MISA Control Point OT 0100. Cost estimates for development and implementation of a BMP Plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
MORBERN INC.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
OT 0100	1314	0	0	NAT	655,800	58,500	FIL	2,545,300	1,601,500	Same as BAT Option 2
					1,889,500	1,543,000	GAC			
					2,545,300	1,601,500	TOTAL			

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
FIL - Multimedia Filtration
NA - Not available

6.0 REFERENCES

1. Morbern Inc. BAT Status of OCM Sector Plants Site Visit Information Report, March 20, 1991.

2. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Applications to Ontario's MISA Program", May 1987.

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR MORBERN INC.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – MORBERN INC. – CORNWALL

ATG	PARAMETER	RMDL	UNIT	IN 0400	OT 0100
1	COD	10	mg/L	–	–
2	Cyanide Total	0.005	mg/L	–	–
3	Hydrogen ion (pH)			–	8.0
4	Ammonia plus Ammonium	0.25	mg/L	–	–
4	Nitrate + Nitrite	0.25	mg/L	–	–
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	–
5	DOC	0.5	mg/L	–	2.6
5	TOC	5	mg/L	–	3
6	Total phosphorus	0.10	mg/L	–	0.03
7	Specific conductance	5	uS/cm	–	298
8	Total suspended solids	5	mg/L	–	3
8	Volatile suspended solids	10	mg/L	–	4
9	Aluminum	30.0	ug/L	–	121.2
9	Boron	50.0	ug/L	–	61.4
9	Copper	10.0	ug/L	–	14.1
9	Zinc	10.0	ug/L	–	42.8
14	Phenolics (4AAP)	2.0	ug/L	–	57.3
16	1,2–Dichloroethane	0.8	ug/L	–	0.6
16	Bromodichloromethane	0.8	ug/L	–	6.8
16	Bromomethane	3.7	ug/L	–	3.2
16	Chloroform	0.7	ug/L	–	9.1
16	Dibromochloromethane	1.1	ug/L	–	4.4
17	Benzene	0.5	ug/L	–	0.7
17	Toluene	0.5	ug/L	–	1.0
17	o–Xylene	0.5	ug/L	–	0.7
25	Oil and grease	1.0	mg/L	–	1.2
98	Ftflow		m3/day	–	1230

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation

(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS

IN 0400 – Intake Water to Site

OT 0100 – East Cooling Water to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN :

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – MORBERN INC. – CORNWALL

ATG	PARAMETER	IN 0400	OT 0100	TOTAL
1	COD	–	–	–
2	Cyanide Total	–	–	–
4	Ammonia plus Ammonium	–	–	–
4	Nitrate + Nitrite	–	–	–
4	Total Kjeldahl Nitrogen	–	–	–
5	DOC	–	3.382	3.382
5	TOC	–	3.570	3.570
6	Total phosphorus	–	0.041	0.041
8	Total suspended solids	–	4.216	4.216
8	Volatile suspended solids	–	4.736	4.736
9	Aluminum	–	0.173	0.173
9	Boron	–	0.087	0.087
9	Copper	–	0.021	0.021
9	Zinc	–	0.054	0.054
14	Phenolics (4AAP)	–	0.018	0.018
16	1,2–Dichloroethane	–	0.001	0.001
16	Bromodichloromethane	–	0.009	0.009
16	Bromomethane	–	0.002	0.002
16	Chloroform	–	0.009	0.009
16	Dibromochloromethane	–	0.004	0.004
17	Benzene	–	0.001	0.001
17	Toluene	–	0.001	0.001
17	o–Xylene	–	*	*
25	Oil and grease	–	1.525	1.525

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS
IN 0400 – Intake Water to Site
OT 0100 – East Cooling Water to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
MORBERN INC.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - MORBERN INC. - CORNWALL

CONTROL POINT - OT 0100 East Cooling Water to River
AVERAGE FLOWRATE = 1230 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate + Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	2.6	3 382	2 6	3.382	2.6	3 382	2.6	3.382	Morbern	Morbern	Morbern
5	TOC	5	mg/L	3	3.570	3	3 570	3	3.570	3	3.570	Morbern	Morbern	Morbern
6	Total phosphorus	0.10	mg/L	0.03	0.041	0.03	0.041	0.03	0.041	0.03	0.041	Morbern	Morbern	Morbern
8	Total suspended solids	5	mg/L	3	4 216	3	4.216	3	4.216	3	4.216	Morbern	Morbern	Morbern
8	Volatile suspended solids	10	mg/L	4	4.736	4	4.736	4	4.736	4	4.736	Morbern	Morbern	Morbern
9	Aluminum	30.0	ug/L	121.2	0.173	121.2	0.173	121.2	0.173	47.0	0.058	Morbern	Morbern	RREL
9	Boron	50.0	ug/L	61.4	0.087	61.4	0.087	61.4	0.087	61.4	0.087	Morbern	Morbern	Morbern
9	Copper	10.0	ug/L	14.1	0.021	14 1	0.021	14.1	0.021	14.1	0.021	Morbern	Morbern	Morbern
9	Zinc	10.0	ug/L	42.8	0.054	42 8	0.054	42.8	0.054	42.8	0.054	Morbern	Morbern	Morbern
14	Phenolics (4AAP)	2.0	ug/L	57.3	0.018	57.3	0.018	2.5	0.003	2.5	0.003	Morbern	Esso	Esso
16	1,2-Dichloroethane	0.8	ug/L	0.6	0 001	0.6	0 001	0.6	0.001	0.6	0.001	Morbern	Morbern	Morbern
16	Bromodichloromethane	0.8	ug/L	6.8	0 009	6 8	0.009	0.4	*	0.4	*	Morbern	Esso	Esso
16	Bromomethane	3.7	ug/L	3.2	0.002	3 2	0.002	3.2	0.002	3.2	0.002	Morbern	Morbern	Morbern
16	Chloroform	0.7	ug/L	9.1	0.009	9.1	0.009	1.2	0.001	1.2	0.001	Morbern	Esso	Esso
16	Dibromochloromethane	1.1	ug/L	4.4	0 004	4.4	0.004	4.4	0 004	4.4	0.004	Morbern	Morbern	Morbern
17	Benzene	0.5	ug/L	0.7	0.001	0.7	0 001	0.7	0.001	0.7	0.001	Morbern	Morbern	Morbern
17	Toluene	0.5	ug/L	1.0	0.001	1.0	0.001	1.0	0.001	1.0	0.001	Morbern	Morbern	Morbern
17	o-Xylene	0.5	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	Morbern	Morbern	Morbern
25	Oil and grease	1.0	mg/L	1.2	1.525	1.2	1.525	1.2	1.525	1.2	1.525	Morbern	Morbern	Morbern

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

NOVACOR CHEMICALS LTD.

1.0 PLANT DESCRIPTION

Novacor Chemicals Ltd. operates the former Union Carbide Canada Ltd. plant located in Mooretown, south of Sarnia. The plant was built between 1974 and 1977 and went into full production in 1978. Current employment is about 240 people.

High density and low density polyethylenes are produced continuously at the site using low pressure and high pressure gas phase polymerization processes. Minor quantities of polymeric oils and waxes are also produced. Polyethylene finds wide application in consumer packaging, piping and wire insulation.

Spent cooling water, boiler and cooling tower blowdown and effluent from the on-site sanitary waste treatment plant are routed to a process wastewater pond for solids settling. The pond effluent is passed through a solids filter before discharge to the St. Clair River through an extended outfall diffuser (MISA Control Point CO 0100).

Stormwater, excess contact cooling water from polymer extrusion and washdown water from areas where there is potential for contact with polyethylene are collected in two retention ponds with traps for polyethylene pellets. The retention ponds normally discharge to the process wastewater pond except in emergencies when the contents of the ponds may be released to Baby Creek.

Details on the plant production processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

As indicated earlier, there are two major systems for collection and treatment of wastewater generated at the site. One system (process wastewater pond) collects spent cooling water, boiler and cooling tower blowdown and effluent from the sanitary waste treatment plant. The other system (retention ponds)

collects primarily stormwater, excess contact cooling water from the polymer extrusion area and washdown water from areas where there is the potential for contamination.

All process, sanitary, and blowdown sewer effluents combine before entry into the 2,600 m^3 process wastewater pond. On a fairly regular basis, wastewater from the retention ponds is also pumped to the process wastewater pond, unless high levels necessitate direct release to waterways. After passing through the process wastewater pond, the combined effluent is discharged through the final effluent sump, through a solids filter and then directly to the St. Clair River (MISA Control Point CO 0100).

In summary, MISA Control Point CO 0100 receives wastewater from the following sources:

- Process wastewater
- HDPE process area
- LDPE process area
- Utilities area
- Tank unloading area
- Quality control laboratory
- Resin recovery overflow
- Sanitary treatment facility effluent
- Effluent wastewater from the retention ponds

The wastewater streams entering the two retention ponds include:

- Surface runoff from inside process areas
- Steam trap condensate
- Resin recovery water
- Caustic sump, catalyst sump, and diked areas in the HDPE unit
- Isopropylalcohol unloading pad sump in the LDPE area

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report at MISA Control Point CO 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, complied and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period indicated that the plant's effluent (MISA Control Point CO 0100) was not acutely lethal. As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0100 indicate that the plant's current pollutant discharge levels are as low or lower than discharge levels from similar organic chemical manufacturing plants in the U.S. and Ontario with the exception of some elevated concentrations of TSS. Development and implementation of a Best Management Practices (BMP) plan is recommended for MISA Control Point CO 0100 to control TSS for BAT Option 2. This pollution prevention approach should focus on the identification of the source(s) and implementation of methods of control for TSS. A draft report prepared by Canada Environment outlines guidelines for a development and implementation of a Best Management Practices (BMP) plan (Ref. 2).

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of pollutants. The draft analytical results of the MISA

monitoring at MISA Control Point CO 0100 showed relatively elevated concentrations of TSS. Based on the pollutant concentrations found during the MISA Twelve Month Monitoring Period, multi-media filtration is recommended for MISA Control Point CO 0100.

3.4 SUMMARY OF BAT OPTIONS

Table 1.0 presents a summary of BAT Option recommended for Novacor Chemicals Ltd.

TABLE 1.0
SUMMARY OF BAT OPTIONS FOR NOVACOR CHEMICALS LTD.
MISA CONTROL POINT CO 0100

BAT Option	DEFINITION	DESCRIPTION
1	Non-lethal effluent	No additional treatment
2	MISA/Ontario BAT/Maximum Pollutant Reduction	BMP's for TSS
3	Zero Discharge/Virtual Elimination	Multimedia filtration

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the

compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Novacor Chemicals Ltd. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 2).

Table 2.0 presents the cost estimates for the technologies considered for each BAT Option for the Novacor Chemicals, Ltd. The only cost estimate is for multimedia filtration. Cost estimates for the development and implementation of a BMP plan could not be developed due to the site-specific nature of the plan.

TABLE 2.0
BAT OPTION MODELS COST ESTIMATES
NOVACOR CHEMICALS LTD.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOG	CAPITAL	O&M	TECHNOLOGY
CO 0100	1,870	0	0	NAT	NA	NA	BMP	731,900	63,900	Filtration

NOTES:

NAT - No additional treatment
NA - Cost estimates not developed

6.0 REFERENCES

1. Novacor Chemicals Ltd. - BAT Status of OCM Sector Plants Site Visit Information Report, April 16, 1991.

2. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Application to Ontario's MISA Program", May 1987.

3. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1087/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR NOVACOR CHEMICALS LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – NOVACOR CHEMICALS LTD. – MOORETOWN

ATG	PARAMETER	RMDL	UNIT	IN 0600	CO 0100
1	COD	10	mg/L	51	26
2	Cyanide Total	0.005	mg/L	0.001	0.002
3	Hydrogen ion (pH)			7.9	8.2
4	Ammonia plus Ammonium	0.25	mg/L	0.03	0.42
4	Nitrate+Nitrite	0.25	mg/L	0.25	0.66
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	1.4
5	DOC	0.5	mg/L	1.6	5.1
5	TOC	5	mg/L	2	7
6	Total phosphorus	0.10	mg/L	0.10	0.41
7	Specific conductance	5	uS/cm	218	617
8	Total suspended solids	5	mg/L	5	15
8	Volatile suspended solids	10	mg/L	4	6
9	Aluminum	30.0	ug/L	50.0	541.7
9	Zinc	10.0	ug/L	6.5	34.3
14	Phenolics (4AAP)	2.0	ug/L	0.7	1.7
15	Sulphide	20.0	ug/L	39.5	44.5
16	Bromodichloromethane	0.8	ug/L	3.2	0.4
16	Chloroform	0.7	ug/L	14.1	0.4
16	Dibromochloromethane	1.1	ug/L	2.7	0.4
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	1.4	2.0
25	Oil and grease	1.0	mg/L	1.0	1.3
98	Ftflow		m3/day	–	1660

EXPLANATORY NOTES:

(i) "–" no concentration data available or not required by regulation

(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point are shown in smaller size.

(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 0600 – Intake Water to Site
CO 0100 – Final Effluent to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – NOVACOR CHEMICALS LTD. – MOORETOWN

ATG	PARAMETER	IN 0600	CO 0100	TOTAL
1	COD	81.649	40.549	40.549
2	Cyanide Total	0.001	0.003	0.003
4	Ammonia plus Ammonium	0.039	0.661	0.661
4	Nitrate+Nitrite	0.395	1.042	1.042
4	Total Kjeldahl Nitrogen	0.797	2.215	2.215
5	DOC	2.556	8.459	8.459
5	TOC	2.552	11.053	11.053
6	Total phosphorus	0.149	0.679	0.679
8	Total suspended solids	7.317	24.785	24.785
8	Volatile suspended solids	5.618	9.710	9.710
9	Aluminum	0.078	0.886	0.886
9	Zinc	0.010	0.056	0.056
14	Phenolics (4AAP)	0.001	0.003	0.003
15	Sulphide	0.062	0.069	0.069
16	Bromodichloromethane	0.005	0.001	0.001
16	Chloroform	0.022	0.001	0.001
16	Dibromochloromethane	0.004	0.001	0.001
19	Bis(2–ethylhexyl) phthalate	0.002	0.003	0.003
25	Oil and grease	1.511	2.163	2.163

SAMPLING POINTS:
IN 0600 – Intake Water to Site
CO 0100 – Final Effluent to River

APPENDIX B

PERFORMANCE DATA OF SELECTED BAT OPTIONS
NOVACOR CHEMICALS LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - NOVACOR CHEMICALS LTD. - MOORETOWN

CONTROL POINT - CO 0100 Final Effluent to River
AVERAGE FLOWRATE = 1660 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	26	40.549	26	40.549	26	40.549	26	40.549	Nova	Nova	Nova
2	Cyanide Total	0.005	mg/L	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.003	Nova	Nova	Nova
4	Ammonia plus Ammonium	0.25	mg/L	0.42	0.661	0.42	0.661	0.42	0.661	0.42	0.661	Nova	Nova	Nova
4	Nitrate+Nitrite	0.25	mg/L	0.66	1.042	0.66	1.042	0.66	1.042	0.66	1.042	Nova	Nova	Nova
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.4	2.215	1.4	2.215	1.4	2.215	1.4	2.215	Nova	Nova	Nova
5	DOC	0.5	mg/L	5.1	8.459	5.1	8.459	5.1	8.459	5.1	8.459	Nova	Nova	Nova
5	TOC	5	mg/L	7	11.053	7	11.053	7	11.053	7	11.053	Nova	Nova	Nova
6	Total phosphorus	0.10	mg/L	0.41	0.679	0.41	0.679	0.41	0.679	0.41	0.679	Nova	Nova	Nova
8	Total suspended solids	5	mg/L	15	24.785	15	24.785	15	24.785	5	8.300	Nova	Nova	P1774
8	Volatile suspended solids	10	mg/L	6	9.710	6	9.710	6	9.710	5	8.300	Nova	Nova	P1774
9	Aluminum	30.0	ug/L	541.7	0.886	541.7	0.886	541.7	0.886	47.0	0.078	Nova	Nova	RREL
9	Zinc	10.0	ug/L	34.3	0.056	34.3	0.056	34.3	0.056	34.3	0.056	Nova	Nova	Nova
14	Phenolics (4AAP)	2.0	ug/L	1.7	0.003	1.7	0.003	1.7	0.003	1.7	0.003	Nova	Nova	Nova
15	Sulphide	20.0	ug/L	44.5	0.069	44.5	0.069	44.5	0.069	44.5	0.069	Nova	Nova	Nova
16	Bromodichloromethane	0.8	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Nova	Nova	Nova
16	Chloroform	0.7	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Nova	Nova	Nova
16	Dibromochloromethane	1.1	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Nova	Nova	Nova
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.0	0.003	2.0	0.003	2.0	0.003	2.0	0.003	Nova	Nova	Nova
25	Oil and grease	1.0	mg/L	1.3	2.163	1.3	2.163	1.3	2.163	1.3	2.163	Nova	Nova	Nova

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

NOVACOR CHEMICALS (CANADA) LTD. - (STYRENE I & II)

1.0 PLANT DESCRIPTION

This facility was formerly the Styrene I and Styrene II operation owned and operated by Polysar Ltd. and was therefore included in the MISA Initial Report and the MISA Monitoring Program completed by Polysar Ltd.

Nova Chemicals purchased the entire Polysar Sarnia complex in September 1988 and operated the complex until 1990 at which time everything but the Styrene I and Styrene II units were sold to Bayer who now operates the rest of the complex using the Polysar name. The Styrene I and Styrene II units are being operated by Novacor Chemical (Canada) Ltd.

The first Styrene unit at this site was designed, constructed, and operated by Dow Chemical beginning in August 1943. Polysar Ltd. assumed operating responsibility of the unit in January 1951. This original unit was shut down in 1966, and the unit was demolished to make room for the new Styrene I unit.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

The Novacor process and cooling water ultimately becomes part of the Polysar, Sarnia discharges. This condition is representative of the MISA monitoring period and continues to the present.

The Styrene I unit collects all process wastewater and stormwater from active production or diked storage areas for pretreatment and discharge to the Polysar wastewater treatment system. Stormwater from non-active areas, including some roadways, is collected in an open ditch which runs across the site and joins the 66-inch Polysar sewer. This ditch also transports the once-through, non-contact cooling water used by the unit.

The Styrene II unit has a separate collection and storage system for stormwater runoff from non-active plant areas. This system utilizes two networks which serve the north and south sides of the plant site. A system of interconnected underground concrete tanks located in native blue clay can contain 1,325 m^3 in the north system and 2,780 m^3 in the south system for treatment in the pretreatment train and discharge to the Polysar wastewater treatment system. Provisions for emergency discharge from this collection and storage network have not been necessary in the four years the system has been functional.

Process water and stormwater from active plant drainage, as well as drainage from diked storage, is collected in a system which feeds directly to the pretreatment train.

Table 1.0 summarizes process and cooling water flows by unit to the Polysar facility.

TABLE 1.0
PROCESS WASTEWATER AND COOLING WATER FLOWS

SOURCE	FLOW	DISCHARGE TO
Styrene I		
Process Water & Active Drainage Area	331 m^3/day	To Polysar BIOX Ultimate Discharge Discharge at PR 1800 Polysar 66-inch Sewer
OTCW[1]	43,200 m^3/day	To River -- CO 0400
Styrene II		
Process Water & Plant Drainage	965 - 1,110 m^3/day	To Polysar BIOX Discharge at PR 1800
Cooling Tower Blowdown	545 0 680 m^3/day	To Polysar BIOX Discharge at PR 1800
Ozone Generator or OTCW	545 m^3/day	To Polysar BIOX Discharge at PR 1800
NOTE: (1) OTCW - Once-through, non-contact cooling water		

2.2 WASTEWATER FLOW AND QUALITY

Novacor's cooling water from Styrene I enters the Polysar Ltd. 66-inch sewer and becomes part of the Polysar's CO 0400 discharge. Process wastewater from both units is discharged to the Polysar wastewater treatment system and becomes part of the Polysar PR 1800 discharge. Data collected during the MISA

Twelve Month Monitoring Period for these monitoring points are available in the Polysar's Report on BAT options (Ref. 2).

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTIONS

Because Novacor is not a direct discharger and since all of their wastewater enters various Polysar Ltd. wastewater handling facilities for treatment or discharge, no evaluation on BAT options could be made at the present time. However, during the site visit, Novacor personnel indicated that the plant is investigating running their own ditch or pipe to the river for direct discharge of cooling water and stormwater runoff from the Styrene I unit. In addition, Novacor is in the process of evaluating the possibility of installing its own wastewater treatment system. A siting and economic analysis is underway for a treatment system which would receive and treat the wastewater now going to Polysar. No timetable was given for these projects during the site visit.

4.0 REFERENCES

1. Novacor Chemicals Ltd. - Styrene I & II - BAT status of OCM Sector Plants, Site Visit Information Report, May 30, 1991.

2. Polysar Ltd. - Ontario Organic Chemical Sector Report on BAT Options.

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

POLYSAR RUBBER CORPORATION LTD.

1.0 PLANT DESCRIPTION

Polysar's Sarnia manufacturing complex is located along the St. Clair River south of the city of Sarnia.

Polysar was originally formed as Polymer Corporation Limited in 1943 to address the shortage of natural rubber which occurred during wartime. Today, Polysar produces a wide variety of synthetic rubbers including nitrile-butadiene, styrene-butadiene, polybutadiene, butyl and halobutyl rubbers. In addition, at the Sarnia site, Polysar extracts isobutylene butadiene from C_4 fractions.

The Polysar plant site consists of ten major units, four producing rubber products, three producing petrochemicals and three providing support services as outlined in Table 1.0.

Four process wastewater streams from butyl, styrene and polybutadiene facilities are treated at the source in the production unit. All other process water streams are treated at the site Biological Oxidation Wastewater Treatment Plant (BIOX), which has been in operation since 1983.

The BIOX plant effluent (MISA Control Point PR 1800) is discharged to the St. Clair River via the Cole Drain. The Cole Drain which originates upstream of the Polysar complex drains numerous plant sites. In addition to the BIOX plant effluent Polysar discharges once-through cooling water and some stormwater into the Cole Drain. Polysar also discharges effluent wastewater to the St. Clair River through an additional five outfalls.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

Process, cooling and storm water generated at the site is discharged directly to the St. Clair River through six outfalls. All these direct outfalls were monitored during the MISA Twelve Month Monitoring Period.

TABLE 1.0
MAJOR UNITS AND PRODUCTS AT POLYSAR LTD.

UNIT	PRODUCTS/PROCESSES	END USES
Rubber Producing Units		
1. Stereo Unit	Polybutadiene Rubber	· tires, plastics additive
2. Emulsion Specialty Plant (ESP)	Acrylonitrile-Butadiene Rubber (NBR) Styrene-Butadiene Rubber (SBR)	· tires
3. Halobutyl Unit	Bromobutyl Rubber, Chlorobutyl Rubber	· tire inner liners
4. Butyl II Unit	Butyl Rubber	· inner tubes
Petrochemical Units		
5. BE #2 Unit	Butadiene Extraction	· use as raw material in rubber producing units
6. BE #3 Unit	Butadiene Extraction	· use as raw material in rubber producing units
7. I-Plant	Isobutylene Extraction	· use as raw material in rubber producing units
Support Units		
8. Steam and Power Plant	Steam and Electricity	· Plant, Nova, Imperial Oil, Dow Fiberglass, etc.
9. Centralized Wastewater Treatment Facilities - BIOX Plant - Main Oil Separator - ESP Waste Treatment System		· Plant
10. Landfill Site		

Table 2.0 presents these outfalls. In addition, two more process wastestreams (MISA Control Points PR 0300 and PR 0900) were monitored during the MISA monitoring program.

TABLE 2.0 POLYSAR LTD. MISA CONTROL POINTS	
MISA CONTROL POINT	**DESCRIPTION**
CO 0200	72 inch sewer to river
CO 0400	66 inch sewer to river
CO 0500	54 inch sewer to river
OT 1400	Turbine cooling water to river
BA 1700	Neutralization sump effluent to river
PR 1800	BIOX effluent to river
PR 0300	Crumb separator effluent (flows into CO 0200)
PR 0900	Butyl II effluent (flows into CO 0400)

MISA Control Point CO 1100 (Cole Drain) was also monitored during the MISA Twelve Month Monitoring Period. It should be noted that the Cole Drain (Township ditch) which originates upstream of the Polysar complex, receives wastewater from numerous area plant sites. Polysar discharges to the Cole Drain include once-through cooling water and some storm water in addition to the BIOX effluent (MISA Control Point PR 1800).

Table 3.0 presents a summary of wastewater sources for each of Polysar's direct discharges.

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points PR 0300, PR 0400, PR 1800, CO 0700, CO 0400, CO 0500, BA 1700, and OT 1400. In addition, draft analytical results for MISA Control Point CO 1100 (Cole Drain) are also presented.

TABLE 3.0 SUMMARY OF WASTEWATER SOURCES AT POLYSAR LTD.	
MISA CONTROL POINT	WASTEWATER SOURCE(S)
PR 1800	· Process wastewater from the Butudiene Extraction (BE) Unit #2 · Process wastewater from BE #3 Unit · Halobutyl oily and rubber process wastewaters · Stereo unit oily process wastewater · Emulsion Specialty Plant (ESP) process wastewater · Nova styrene II process wastewater · Akzo, BASF and phenolic third party wastewaters · Landfill runoff and leachate · BIOX plant storm water runoff
PR 0300	· Stereo (synthetic polybutadiene unit) rubber process wastewater (flows into CO 0200)
PR 0900	· Process wastewater from Butyl II unit (flows into CO 0400)
CO 0200	· Crumb separator effluent (PR 0300) · Stereo plant once-through cooling water
CO 0400	· Butyl II effluent (PR 0900) · Halobutyl once-through cooling water · Halobutyl storm water runoff
CO 0500	· BE #3 once-through cooling water (OTCW) · Isobutylene extraction (I-Plant) OTCW · Steam and power boiler blowdown
OT 1400	· Once-through non-contact turbine cooling water
BA 1700	· Neutralization sump effluent from the steam and power plant backwashes
CO 1100	· BE #2 unit OTCW · Butyl II unit storm water runoff · ESP unit OTCW

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period at MISA Control Points CO 0200 and CO 0500 were determined to be acutely lethal to Daphnia Magna and/or Rainbow Trout. An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity unit did not reveal any probable cases of the observed acute toxicity (Ref. 2).

Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Points CO 0200 and CO 0500 to assess the toxicity problems identified. A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 3).

3.2 BAT OPTION 2

BAT Option 2 incorporates those best available technologies found at similar U.S. or Ontario organic chemical manufacturing plants that, if installed, will achieve the maximum overall pollutant reduction.

3.2.1 MISA Control Point PR 0300 (Crumb Separator Effluent)

The draft analytical results as obtained from MISA OCM Sector Twelve Month Report for MISA Control Point PR 0300 showed elevated concentrations of volatile organic pollutants (VOCs) and metals.

High concentrations of VOC pollutants and metals included: benzene (2384.5 ug/l), chloromethane (166.9 ug/l), toluene (26.7 ug/l), bromomethane (47.4 ug/l), chloroform (27.1 ug/l), aluminum (7649.6 ug/l) and cobalt (468.5 ug/l). Steam stripping is recommended for the reduction of elevated concentrations of

volatile organic pollutants and chemical precipitation is recommended to reduce the elevated concentrations of metals found at MISA Control Point PR 0300 for BAT Option 2.

3.2.2 MISA Control Point PR 0900 (Butyl II Effluent)

The draft analytical results from MISA Control Point PR 0900 as obtained from the MISA OCM Sector Twelve Month Report also showed elevated concentrations of volatile organic pollutants.

High concentrations of VOC's detected at PR 0900 included: bromomethane (4153.4 ug/l), chloroform (67.7 ug/l), chloromethane (56526.1 ug/l), methylene chloride (200.8 ug/l), benzene (247.5 ug/l) and toluene (90.7 ug/l). Steam stripping is the demonstrated technology for the reduction of VOC's pollutant concentrations and therefore, is recommended for MISA Control Point PR 0900 for BAT Option 2.

3.2.3 MISA Control Point CO 0200 (72 Inch Sewer to River)

The draft analytical results from MISA Control Point CO 0200 as obtained from the MISA OCM Sector Twelve Month Report showed elevated concentration of some volatile organic pollutants most notably benzene (65.3 ug/l). The source of the elevated volatile organic pollutant concentrations at MISA Control Point CO 0200 is the effluent from the crumb separator (PR 0300) which flows into MISA Control Point CO 0200. With the reduction of volatile organic pollutant concentrations that are expected after the steam stripping installation at MISA Control Point PR 0300, no additional treatment is recommended for MISA Control Point CO 0200 for BAT Option 2.

3.2.4 MISA Control Point CO 0400 (66 Inch Sewer to River)

The draft analytical results as obtained from the MISA OCM Sector Twelve Month Report at MISA Control Point CO 0400 generally show low to minimal pollutant concentrations with the exception of some volatile organic pollutants, most notably bromomethane and chloromethane. Chloromethane was detected at an average concentration of 1194.3 ug/l while bromomethane was detected at an average concentration of 114.9 ug/l. The Butyl II unit untreated effluent (MISA Control Point PR 0900) which flows into MISA Control Point CO 0400 is the source of the elevated volatile organic pollutant concentrations observed at MISA Control Point CO 0400. With the reduction of volatile organic pollutant concentrations that is expected after the steam stripping installation at MISA Control Point PR 0900, no additional treatment is recommended for MISA Control Point CO 0400 for BAT Option 2.

3.2.5 MISA Control Point CO 0500 (54 Inch Sewer to River)

The draft analytical results from MISA Control Point CO 0500 as obtained from the MISA OCM Sector Twelve Month Report showed little or no contamination. Most of the pollutants present were at or below minimal analytical detection levels. As a result, no additional treatment is recommended for MISA Control Point CO 0500 for BAT Option 2.

3.2.6 MISA Control Point OT 1400 (Turbine Cooling Water to River)

No additional treatment is recommended for MISA Control Point OT 1400 for BAT Option 2. The current effluent pollutant concentrations from MISA Control Point OT 1400 were at or below analytical detection levels or at intake water levels.

3.2.7 MISA Control Point BA 1700 (Neutralization Sump Effluent)

Polysar's current discharge at MISA Control Point BA 1700 consists of batch discharges of the steam and power plant backwashes. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point BA 1700 showed that Polysar's current pollutant discharge levels are as low or lower than discharge levels at similar U.S. or Ontario OCM Sector plants. Therefore, no additional treatment is recommended for BAT Option 2.

3.2.8 MISA Control Point PR 1800 (BIOX Effluent to River)

The draft analytical results for MISA Control Point PR 1800 obtained from the MISA OCM Sector Twelve Month Report showed that Polysar's current pollutant discharge levels are as low or lower than discharge levels at similar U.S. or Ontario OCM Sector plants with the exception of some elevated concentrations of volatile organic pollutants. Untreated effluent from the halobutyl unit is most probably the source of these contaminants. Therefore, steam stripping is recommended for the process wastewater originating from the halobutyl unit for BAT Option 2.

3.2.9 MISA Control Point CO 1100 (Cole Drain)

As indicated previously, the Cole Drain is used to drain numerous other area plants. Polysar's only contribution to the Cole Drain consists of once-through non-contact cooling water and storm water runoff. Since Polysar is not the only contributor of wastewater to the Cole Drain, technology for the cleanup of the Cole Drain discharge was not considered as part of Polysar's requirements.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and zero discharge of contaminants and consists of any current technology or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors.

Elevated concentrations of metals (especially aluminum) and organics were reported for MISA Control Points PR 0300, PR 0900, PR 1800 and BA 1700 during the MISA Twelve Month Monitoring Period. Granular activated carbon and multi-media filtration are recommended for the reduction of aluminum and other metals as well as organic and conventional pollutants at MISA Control Points PR 0300, PR 0900, PR 1800 and BA 1700.

Based on current and projected pollutant concentrations, no additional treatment is recommended for the remaining Polysar MISA Control Points for BAT Option 3.

In a September 15, 1992 letter to MOE, Polysar personnel suggested alternative technologies and costs for the PR1800 wastestream including:

- Addition of a diversion holding tank prior to the BIOX unit to equalize peak flows at a capital cost of $2,000,000 to $3,000,000.

Since SAIC has not had the opportunity to review the background information on this recommended technology and associated costs, it has only been referenced here rather than included in our recommendations.

3.4 SUMMARY OF BAT OPTIONS

Table 4.0 presents a summary of the BAT Options recommended for Polysar Ltd.

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 COST ESTIMATES OF SELECTED BAT OPTION MODELS

This section presents the cost estimates associated with the control and treatment for the technologies considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost

TABLE 4.0 SUMMARY OF BAT OPTIONS FOR POLYSAR LTD.		
BAT OPTION	**DEFINITION**	**DESCRIPTION**
A) MISA CONTROL POINT PR 0300 (Crumb Separator Effluent, Flows into CO 0200)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater to steam stripping and chemical precipitation
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration
B) MISA CONTROL POINT PR 0900 (Butyl II Effluent, Flows into CO 0400)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater to steam stripping for VOC's removal
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration
C) MISA CONTROL POINT CO 0200 (72" Sewer to River)		
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
D) MISA CONTROL POINT CO 0400 (66" Sewer to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
E) MISA CONTROL POINT CO 0500 (54" Sewer to River)		
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
F) MISA CONTROL POINT PR 1800 (BIOX Effluent to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater from halobutyl unit to steam stripping
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration
G) MISA CONTROL POINT OT 1400 (Turbine Cooling Water to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
H) MISA CONTROL POINT BA 1700 (Neutralization Sump Effluent to River)		
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and zero discharge of contaminants and consists of any current technology or combination of current technologies including supplemental/add-on or cross-over technologies from other industrial sectors.

Elevated concentrations of metals (especially aluminum) and organics were reported for MISA Control Points PR 0300, PR 0900, PR 1800 and BA 1700 during the MISA Twelve Month Monitoring Period. Granular activated carbon and multi-media filtration are recommended for the reduction of aluminum and other metals as well as organic and conventional pollutants at MISA Control Points PR 0300, PR 0900, PR 1800 and BA 1700.

Based on current and projected pollutant concentrations, no additional treatment is recommended for the remaining Polysar MISA Control Points for BAT Option 3.

In a September 15, 1992 letter to MOE, Polysar personnel suggested alternative technologies and costs for the PR1800 wastestream including:

- Addition of a diversion holding tank prior to the BIOX unit to equalize peak flows at a capital cost of $2,000,000 to $3,000,000.

Since SAIC has not had the opportunity to review the background information on this recommended technology and associated costs, it has only been referenced here rather than included in our recommendations.

3.4 SUMMARY OF BAT OPTIONS

Table 4.0 presents a summary of the BAT Options recommended for Polysar Ltd.

4.0 PERFORMANCE DATA FOR SELECTED BAT OPTIONS

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

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TABLE 4.0
SUMMARY OF BAT OPTIONS FOR POLYSAR LTD.

BAT OPTION	DEFINITION	DESCRIPTION
A)	MISA CONTROL POINT PR 0300 (Crumb Separator Effluent, Flows into CO 0200)	
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater to steam stripping and chemical precipitation
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration
B)	MISA CONTROL POINT PR 0900 (Butyl II Effluent, Flows into CO 0400)	
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater to steam stripping for VOC's removal
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration
C)	MISA CONTROL POINT CO 0200 (72" Sewer to River)	
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
D)	MISA CONTROL POINT CO 0400 (66" Sewer to River)	
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
E)	MISA CONTROL POINT CO 0500 (54" Sewer to River)	
1	Non-lethal effluent	Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
F)	MISA CONTROL POINT PR 1800 (BIOX Effluent to River)	
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Process wastewater from halobutyl unit to steam stripping
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multimedia filtration
G)	MISA CONTROL POINT OT 1400 (Turbine Cooling Water to River)	
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	No additional treatment
H)	MISA CONTROL POINT BA 1700 (Neutralization Sump Effluent to River)	
1	Non-lethal effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	No additional treatment
3	Zero Discharge/Virtual Elimination	Granular activated carbon and multumedia filtration

estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower. Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for the Polysar Ltd. plant for steam stripping were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 4).

Table 5.0 presents the cost estimates developed for the technologies considered for each BAT option for Polysar Ltd. Cost estimates for development and implementation of a TIE Study could not be developed due to the site-specific nature of the study.

TABLE 5.0
BAT OPTION MODELS COST ESTIMATES
POLYSAR LTD.

MISA CONTROL POINT	DESIGN FLOW[(1)] m³/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
PR 0300	3,440	0	0	NAT	1,026,900 1,720,600 2,747,500	150,600 2,273,400 2,424,000	CP SS TOTAL	2,747,500 7,817,100 909,900 11,474,500	2,424,000 532,200 75,200 3,031,400	Option 2 GAC FIL TOTAL
PR 0900	2,945	0	0	NAT	1,629,300	1,811,600	SS	1,629,300 7,407,700 858,600 9,895,600	1,811,600 474,700 72,100 2,358,400	Option 2 GAC FIL TOTAL
PR 1800	4,030/20,000	0	0	NAT	1,820,700	2,879,600	SS	1,820,700 20,520,000 2,048,700 24,389,400	2,879,600 2,162,400 131,800 5,173,800	Option 2 GAC FIL TOTAL
CO 0200	82,234	NA	NA	TIE	0	0	NAT	0	0	NAT
CO 0400	179,000	0	0	NAT	0	0	NAT	0	0	NAT
CO 0500	196,800	NA	NA	TIE	0	0	NAT	0	0	NAT
OT 1400	124,530	0	0	NAT	0	0	NAT	0	0	NAT
BA 1700	600	0	0	NAT	0	0	NAT	1,022,100 554,000 1,576,100	702,400 49,200 751,600	GAC FIL TOTAL

NOTES:

NA - Cost estimates not developed
NAT - No Additional Treatment
SS - Steam Stripper
CP - Chemical Precipitation
GAC - Granular Activated Carbon
FIL - Multimedia Filtration
(1) - Flow rates for PR 1800: BAT Option 2 = 4,030 m³/day
BAT Option 3 = 20,000 m³/day

6.0 REFERENCES

1. Polysar Ltd. BAT Status of the OCM Sector Plants Site Visit Information Report, April 23-24, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirer, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fiber Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR POLYSAR LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – POLYSAR LTD. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 2400	PR 0300	PR 0900	PR 1800	CO 0200	CO 0400	CO 0500	OT 1400	BA 1700	@@ CO 1100
1	COD	10	mg/L	17	11	45	69	10	9	22	–	18	15
2	Cyanide Total	0.005	mg/L	0.001	•••	0.001	0.003	•••	•••	•••	–	0.004	0.001
3	Hydrogen ion (pH)			8.2	7.6	7.6	7.6	8.2	8.2	8.3	8.2	7.7	8.2
4	Ammonia plus Ammonium	0.25	mg/L	0.13	0.16	0.13	1.57	0.11	0.08	0.06	–	1.78	0.09
4	Nitrate+Nitrite	0.25	mg/L	0.36	0.23	0.09	2.15	0.34	0.25	0.33	–	2.75	0.45
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.5	0.3	0.8	2.3	0.3	0.2	0.2	–	2.0	0.3
5	DOC	0.5	mg/L	2.8	4.7	10.8	16.7	2.9	2.8	2.7	3.1	8.9	3.2
5	TOC	5	mg/L	3	5	13	15	7	2	4	3	8	3
6	Total phosphorus	0.10	mg/L	0.09	0.28	0.36	0.71	0.10	0.10	0.11	0.10	0.11	0.10
7	Specific conductance	5	uS/cm	223	239	467	2536	230	234	230	222	5099	304
8	Total suspended solids	5	mg/L	5	36	24	15	5	4	4	7	12	6
8	Volatile suspended solids	10	mg/L	4	8	5	8	4	4	4	–	4	4
9	Aluminum	30.0	ug/L	75.6	7649.6	3443.1	1453.7	190.8	96.1	55.0	91.3	163.1	118.2
9	Boron	50.0	ug/L	13.0	12.5	17.1	31.6	13.2	12.9	13.8	13.3	65.5	43.3
9	Cobalt	20.0	ug/L	2.3	468.5	2.3	2.2	12.3	2.4	2.3	2.3	4.7	2.4
9	Molybdenum	20.0	ug/L	3.0	3.0	3.1	14.9	3.0	3.0	3.0	3.0	3.5	3.0
9	Nickel	20.0	ug/L	9.0	9.8	9.0	23.3	9.0	9.0	9.0	9.0	9.1	9.0
9	Zinc	10.0	ug/L	6.5	9.3	717.9	20.0	5.8	17.6	8.5	8.3	17.1	8.3
10	Antimony	5.0	ug/L	5.4	6.3	4.7	5.4	3.3	9.0	4.8	–	17.3	4.8
11	Chromium (hexavalent)	10.0	ug/L	20.0	–	20.0	–	–	10.5	–	–	–	–
14	Phenolics (4AAP)	2.0	ug/L	1.3	10.5	9.7	10.1	3.1	1.4	2.2	–	16.3	2.4
15	Sulphide	20.0	ug/L	31.7	37.3	127.5	125.0	32.3	32.5	40.0	–	55.0	60.0

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – POLYSAR LTD. – SARNIA

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ATG	PARAMETER	RMDL	UNIT	IN 2400	PR 0300	PR 0900	PR 1800	CO 0200	CO 0400	CO 0500	OT 1400	BA 1700	CO 1100
16	1,1,2,2–Tetrachloroethane	4.3	ug/L	0.4	1.6	20.0	0.8	0.4	3.5	0.4	0.4	0.4	0.4
16	1,1,2–Trichloroethane	0.6	ug/L	0.6	2.3	29.4	0.9	0.6	3.6	0.6	0.6	0.6	0.6
16	1,1–Dichloroethane	0.8	ug/L	0.5	2.0	24.9	0.7	0.5	2.8	0.5	0.5	0.5	0.5
16	1,1–Dichloroethylene	2.8	ug/L	0.4	1.8	95.4	0.7	0.4	3.9	0.4	0.4	0.4	0.4
16	1,2–Dichlorobenzene	1.4	ug/L	0.4	1.7	21.3	0.7	0.4	3.0	0.4	0.4	0.4	0.4
16	1,2–Dichloroethane	0.8	ug/L	0.4	1.7	21.5	0.6	0.4	2.5	0.4	0.4	0.4	0.4
16	1,2–Dichloropropane	0.9	ug/L	0.5	2.2	28.2	0.8	0.5	3.5	0.5	0.5	0.5	0.5
16	1,3–Dichlorobenzene	1.1	ug/L	0.3	1.4	17.8	0.6	0.3	2.7	0.3	0.3	0.3	0.3
16	1,4–Dichlorobenzene	1.7	ug/L	0.2	1.0	13.9	0.5	0.2	2.4	0.2	0.2	0.2	0.2
16	Bromodichloromethane	0.8	ug/L	0.4	7.4	35.3	0.7	1.6	4.4	2.8	0.4	0.4	1.1
16	Bromoform	3.7	ug/L	0.4	1.6	17.9	9.8	0.4	2.8	0.4	0.4	0.4	3.0
16	Bromomethane	3.7	ug/L	2.2	47.4	4153.4	2.9	2.3	114.9	2.3	2.2	2.4	2.3
16	Carbon tetrachloride	1.3	ug/L	0.3	1.3	16.7	0.6	0.3	2.7	0.3	0.3	0.3	0.3
16	Chlorobenzene	0.7	ug/L	0.6	2.4	29.5	0.8	0.6	3.1	0.6	0.6	0.6	0.6
16	Chloroform	0.7	ug/L	0.4	27.1	67.7	7.5	1.4	3.2	5.8	0.5	0.5	1.5
16	Chloromethane	3.7	ug/L	2.2	166.9	56526.1	4.0	2.2	1194.3	2.6	2.2	2.3	2.4
16	Cis–1,3–Dichloropropylene	1.4	ug/L	0.7	2.9	35.1	1.0	0.7	4.0	0.7	0.7	0.7	0.7
16	Dibromochloromethane	1.1	ug/L	0.4	1.8	28.3	0.9	0.6	3.3	2.6	0.4	0.4	1.3
16	Ethylene dibromide	1.0	ug/L	0.6	2.3	29.4	0.9	0.6	3.6	0.6	0.6	0.6	0.6
16	Methylene chloride	1.3	ug/L	0.6	39.6	200.8	2.1	2.3	7.1	0.4	0.4	0.3	0.3
16	Tetrachloroethylene	1.1	ug/L	0.2	0.8	11.0	0.6	0.2	2.8	0.2	0.2	0.2	0.2
16	Trans–1,2–Dichloroethylene	1.4	ug/L	0.4	1.7	21.5	0.6	0.4	2.5	0.4	0.4	0.4	0.4
16	Trans–1,3–Dichloropropylene	1.4	ug/L	1.0	4.4	53.5	1.3	1.1	5.4	1.1	1.0	1.1	1.1
16	Trichloroethylene	1.9	ug/L	0.3	1.3	16.7	0.6	0.3	2.7	0.3	0.3	0.3	0.3
16	Trichlorofluoromethane	1.0	ug/L	0.4	1.5	21.5	1.1	0.3	5.4	0.3	0.3	0.3	0.3
16	Vinyl chloride	4.0	ug/L	2.7	11.7	146.7	3.7	2.8	15.0	2.8	2.7	2.9	3.1
17	Benzene	0.5	ug/L	0.3	2384.5	247.5	1.6	65.3	61.0	0.8	0.2	0.4	0.8
17	Ethylbenzene	0.6	ug/L	0.4	1.6	19.0	0.7	0.4	3.2	0.7	0.5	1.2	0.4
17	Styrene	0.5	ug/L	0.4	1.5	18.1	0.6	0.4	2.5	0.4	0.4	0.4	1.5
17	Toluene	0.5	ug/L	0.7	26.7	90.7	1.4	1.8	16.1	2.5	0.5	0.4	1.5
17	m–Xylene and p–Xylene	1.1	ug/L	0.6	2.6	56.7	1.1	0.6	4.9	0.7	0.5	0.5	0.5
17	o–Xylene	0.5	ug/L	0.4	1.7	37.0	0.6	0.4	2.5	0.4	0.4	0.4	0.4

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – POLYSAR LTD. – SARNIA

ATG	PARAMETER	RMDL	UNIT	IN 2400	PR 0300	PR 0900	PR 1800	CO 0200	CO 0400	CO 0500	OT 1400	BA 1700	@@ CO 1100
18	Acrolein	4.0	ug/L	2.9	13.5	150.6	4.2	3.0	17.6	3.6	2.8	3.0	3.8
18	Acrylonitrile	4.2	ug/L	1.8	8.5	97.0	2.8	1.9	11.2	1.9	1.8	1.9	1.9
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	1.4	1.4	1.8	7.2	2.3	2.3	1.4	–	15.1	1.5
20	2,6–Dichlorophenol	2.0	ug/L	–	1.1	1.1	1.1	1.1	1.1	1.1	–	2.6	1.1
23	1,2,4–Trichlorobenzene	10.0	ng/L	6.4	31.1	6.1	15.0	6.7	113.9	8.2	–	11.1	72
23	2,4,5–Trichlorotoluene	10.0	ng/L	4.8	3.0	3.3	4.8	8.0	3.1	3.2	–	2.7	110.1
23	Hexachlorobenzene	10.0	ng/L	4.8	6.4	3.4	3.5	5.9	7.5	4.0	–	3.5	16.5
23	Hexachlorobutadiene	10.0	ng/L	7.2	4.5	2.6	4.5	19.8	5.9	7.9	–	2.5	74.7
23	Hexachloroethane	10.0	ng/L	7.0	5.8	5.8	6.7	14.0	28.7	4.1	–	1.7	13.2
23	Octachlorostyrene	10.0	ng/L	3.0	2.7	2.7	2.7	3.5	2.8	2.8	–	2.6	10.7
23	Pentachlorobenzene	10.0	ng/L	2.4	2.4	2.1	3.0	3.0	2.3	2.8	–	2.1	9.7
25	Oil and grease	1.0	mg/L	1.0	2.1	5.7	3.8	1.2	1.2	1.5	1.5	3.5	1.5
98	Ftflow		m3/day	–	2674	2338	12432	67567	143338	169478	62922	**	105363
98	Volume Discharged – Total		m3	**	**	**	**	**	**	**	**	418	**

EXPLANTATORY CODES:
(i) "–" no concentration data available or not required by regulation
(ii) "***" parameter does not pertain to this stream
(iii) "****" cyanide concentration less than 0.001 mg/L
(iv) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(v) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS
IN 2400 – Intake Water
PR 0300 – Crumb Separator flows into CO 0200
PR 0900 – Butyl II flows into CO 0400
BA 1700 – Neutralization Sump to River
PR 1800 – Biox Effluent to River

CO 0200 – 72 inch Sewer to River
CO 0400 – 66 inch Sewer to River
CO 0500 – 54 inch Sewer to River
OT 1400 – Turbine Cooling Water to River
@@ CO 1100 – Cole Drain to River draining numerous plant sites – monitored by Polysar

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – POLYSAR LTD. – SARNIA

ATG	PARAMETER	IN 2400	PR 0300	PR 0900	PR 1800	CO 0200	CO 0400	CO 0500	OT 1400	BA 1700	TOTAL	@@ CO 1100
1	COD	7967.187	30.189	120.638	929.999	680.025	1455.575	3562.976	–	12.514	6641.089	1094.036
2	Cyanide Total	0.456	0.001	0.003	0.035	0.023	0.079	0.076	–	0.005	0.218	0.096
4	Ammonia plus Ammonium	56.967	0.427	0.339	19.582	8.008	13.991	8.899	–	1.606	52.086	7.102
4	Nitrate+Nitrite	163.609	0.533	0.254	29.014	22.638	34.313	54.405	–	2.032	142.402	41.869
4	Total Kjeldahl Nitrogen	226.501	0.866	1.872	29.026	20.466	33.515	39.235	–	1.900	124.142	25.399
5	DOC	1283.354	12.962	25.628	200.134	199.310	411.053	466.467	144.030	6.950	1427.944	309.927
5	TOC	1270.138	14.377	30.578	187.095	488.471	213.966	749.606	7.448	7.009	1653.595	421.312
6	Total phosphorus	40.105	0.761	0.765	8.463	6.985	15.011	18.498	7.048	0.082	56.087	9.309
8	Total suspended solids	2429.532	100.055	59.551	189.032	316.758	616.704	744.725	299.740	10.053	2177.012	708.704
8	Volatile suspended solids	1642.475	21.457	12.582	98.273	249.627	576.532	618.900	–	2.606	1545.938	326.102
9	Aluminum	34.471	21.129	7.368	18.459	13.415	14.888	8.932	3.306	0.090	59.090	11.311
9	Boron	5.915	0.035	0.045	0.388	0.936	1.981	2.261	0.784	0.055	6.405	4.080
9	Cobalt	1.040	1.295	0.006	0.027	0.873	0.349	0.361	0.127	0.004	1.741	0.226
9	Molybdenum	1.376	0.008	0.008	0.184	0.214	0.451	0.492	0.189	0.003	1.533	0.277
9	Nickel	4.102	0.027	0.023	0.293	0.641	1.355	1.478	0.566	0.007	4.340	0.830
9	Zinc	2.980	0.025	1.623	0.249	0.418	2.677	1.440	0.586	0.011	5.381	0.738
10	Antimony	2.443	0.015	0.011	0.069	0.220	1.306	0.782	–	0.016	2.393	0.459
11	Chromium (hexavalent)	9.115	–	0.063	–	–	1.321	–	–	–	1.321	–
14	Phenolics (4AAP)	0.585	0.029	0.021	0.113	0.228	0.211	0.369	–	0.010	0.931	0.217
15	Sulphide	14.459	0.096	0.349	1.691	2.281	5.280	6.789	–	0.026	16.067	5.778

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – POLYSAR LTD. – SARNIA

ATG	PARAMETER	IN 2400	PR 0300	PR 0900	PR 1800	CO 0200	CO 0400	CO 0500	OT 1400	BA 1700	TOTAL	@@ CO 1100
16	1,1,2,2–Tetrachloroethane	0.196	0.005	0.055	0.009	0.031	0.430	0.076	0.029	*	0.575	0.043
16	1,1,2–Trichloroethane	0.262	0.007	0.077	0.010	0.042	0.518	0.103	0.041	*	0.714	0.060
16	1,1–Dichloroethane	0.216	0.006	0.065	0.008	0.035	0.418	0.086	0.034	*	0.581	0.049
16	1,1–Dichloroethylene	0.179	0.005	0.345	0.007	0.028	0.594	0.070	0.027	*	0.726	0.040
16	1,2–Dichlorobenzene	0.179	0.005	0.057	0.007	0.028	0.403	0.070	0.027	*	0.535	0.040
16	1,2–Dichloroethane	0.175	0.005	0.056	0.007	0.028	0.366	0.069	0.027	*	0.497	0.039
16	1,2–Dichloropropane	0.220	0.007	0.074	0.009	0.036	0.492	0.086	0.034	*	0.657	0.049
16	1,3–Dichlorobenzene	0.137	0.004	0.049	0.006	0.021	0.351	0.053	0.021	*	0.452	0.030
16	1,4–Dichlorobenzene	0.095	0.003	0.039	0.005	0.015	0.295	0.036	0.014	*	0.365	0.020
16	Bromodichloromethane	0.179	0.020	0.106	0.008	0.112	0.676	0.486	0.027	*	1.309	0.095
16	Bromoform	0.171	0.005	0.049	0.122	0.026	0.360	0.070	0.025	*	0.603	0.220
16	Bromomethane	1.025	0.134	10.048	0.035	0.164	17.992	0.405	0.164	0.002	18.762	0.233
16	Carbon tetrachloride	0.137	0.004	0.046	0.006	0.021	0.339	0.053	0.021	*	0.440	0.030
16	Chlorobenzene	0.258	0.007	0.076	0.009	0.041	0.482	0.102	0.041	*	0.675	0.058
16	Chloroform	0.182	0.074	0.210	0.094	0.100	0.495	1.013	0.030	*	1.732	0.123
16	Chloromethane	0.995	0.470	140.590	0.046	0.159	162.238	0.436	0.157	0.002	163.038	0.235
16	Cis–1,3–Dichloropropylene	0.304	0.009	0.092	0.011	0.048	0.594	0.120	0.048	*	0.821	0.069
16	Dibromochloromethane	0.179	0.005	0.075	0.010	0.039	0.455	0.443	0.027	*	0.974	0.103
16	Ethylene dibromide	0.262	0.007	0.077	0.010	0.042	0.518	0.103	0.041	*	0.714	0.059
16	Methylene chloride	0.264	0.107	0.534	0.019	0.164	0.743	0.066	0.021	*	1.013	0.034
16	Tetrachloroethylene	0.103	0.003	0.033	0.006	0.015	0.298	0.037	0.014	*	0.370	0.024
16	Trans–1,2–Dichloroethylene	0.175	0.005	0.056	0.006	0.028	0.366	0.069	0.027	*	0.496	0.039
16	Trans–1,3–Dichloropropylene	0.470	0.013	0.138	0.016	0.076	0.850	0.187	0.075	0.001	1.205	0.107
16	Trichloroethylene	0.137	0.004	0.046	0.006	0.021	0.339	0.053	0.021	*	0.440	0.030
16	Trichlorofluoromethane	0.165	0.005	0.065	0.011	0.023	0.584	0.057	0.021	*	0.696	0.032
16	Vinyl chloride	1.245	0.035	0.378	0.042	0.200	2.345	0.493	0.198	0.002	3.280	0.300
17	Benzene	0.117	6.548	0.386	0.012	2.161	5.786	0.137	0.014	*	8.110	0.076
17	Ethylbenzene	0.188	0.005	0.052	0.008	0.028	0.409	0.116	0.029	0.001	0.591	0.044
17	Styrene	0.175	0.005	0.048	0.007	0.028	0.364	0.069	0.027	*	0.495	0.159
17	Toluene	0.314	0.082	0.270	0.015	0.124	3.068	0.429	0.034	*	3.670	0.121
17	m–Xylene and p–Xylene	0.254	0.008	0.131	0.011	0.042	0.603	0.123	0.034	*	0.813	0.051
17	o–Xylene	0.175	0.005	0.081	0.007	0.028	0.366	0.069	0.027	*	0.497	0.039

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – POLYSAR LTD. – SARNIA

ATG	PARAMETER	IN 2400	PR 0300	PR 0900	PR 1800	CO 0200	CO 0400	CO 0500	OT 1400	BA 1700	TOTAL	@@ CO 1100
18	Acrolein	1.302	0.041	0.394	0.047	0.211	3.417	0.630	0.205	0.002	4.512	0.385
18	Acrylonitrile	0.831	0.026	0.256	0.031	0.132	2.164	0.327	0.130	0.001	2.785	0.194
19	Bis(2–ethylhexyl) phthalate	0.654	0.004	0.005	0.090	0.173	0.319	0.238	–	0.010	0.830	0.134
20	2,6–Dichlorophenol	–	0.003	0.003	0.014	0.075	0.166	0.180	–	0.001	0.436	0.101
23	1,2,4–Trichlorobenzene	0.003	*	*	*	*	0.023	0.001	–	*	0.024	0.001
23	2,4,5–Trichlorotoluene	0.002	*	*	*	*	*	*	–	*	*	0.010
23	Hexachlorobenzene	0.002	*	*	*	*	0.001	0.001	–	*	0.002	0.002
23	Hexachlorobutadiene	0.003	*	*	*	0.001	0.001	0.001	–	*	0.003	0.007
23	Hexachloroethane	0.003	*	*	*	0.001	0.005	*	–	*	0.006	0.001
23	Octachlorostyrene	0.001	*	*	*	*	*	*	–	*	*	0.001
23	Pentachlorobenzene	0.001	*	*	*	*	*	*	–	*	*	0.001
25	Oil and grease	477.156	5.117	13.381	47.183	77.407	160.873	263.946	104.058	2.678	656.145	158.672

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 2400 – Intake Water
PR 0300 – Crumb Separator flows into CO 0200
PR 0900 – Butyl II flows into CO 0400
PR 1800 – Biox Effluent to River
CO 0200 – 72 inch Sewer to River
CO 0400 – 66 inch Sewer to River
CO 0500 – 54 inch Sewer to River
OT 1400 – Turbine Cooling Water to River
BA 1700 – Neutralization Sump to River
@@ CO 1100 – Cole Drain to River draining numerous plant sites – monitored by Polysar – not included in the total loading for the site

APPENDIX B

PERFORMANCE DATA OF SELECTED BAT OPTIONS
POLYSAR LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 0300 - Crumb Separator flows into CO 0200

AVERAGE FLOWRATE = 2674 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	11	30.189	11	30.189	11	30.189	11	30.189	Polysar	Polysar	Polysar
4	Ammonia plus Ammonium	0.25	mg/L	0.16	0.427	0.16	0.427	0.16	0.427	0.16	0.427	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	0.23	0.533	0.23	0.533	0.23	0.533	0.23	0.533	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	0.866	0.3	0.866	0.3	0.866	0.3	0.866	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	4.7	12.962	4.7	12.962	4.7	12.962	4.7	12.962	Polysar	Polysar	Polysar
5	TOC	5	mg/L	5	14.377	5	14.377	5	14.377	5	14.377	Polysar	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.28	0.761	0.28	0.761	0.28	0.761	0.28	0.761	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	36	100.055	36	100.055	36	100.055	36	100.055	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	8	21.457	8	21.457	8	21.457	8	21.457	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	7649.6	21.129	7649.6	21.129	1500.0	4.011	47.0	0.126	Polysar	RREL	RREL
9	Boron	50.0	ug/L	12.5	0.035	12.5	0.035	12.5	0.035	12.5	0.035	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	468.5	1.295	468.5	1.295	80.0	0.214	80.0	0.214	Polysar	RREL	RREL
9	Molybdenum	20.0	ug/L	3.0	0.008	3.0	0.008	3.0	0.008	3.0	0.008	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.8	0.027	9.8	0.027	9.8	0.027	9.8	0.027	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	9.3	0.025	9.3	0.025	9.3	0.025	9.3	0.025	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	6.3	0.015	6.3	0.015	6.3	0.015	6.3	0.015	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-	Polysar	Polysar	Polysar
14	Phenolics (4AAP)	2.0	ug/L	10.5	0.029	10.5	0.029	10.5	0.029	10.5	0.029	Polysar	Polysar	Polysar
15	Sulphide	20.0	ug/L	37.3	0.096	37.3	0.096	37.3	0.096	37.3	0.096	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	1.6	0.005	1.6	0.005	1.6	0.005	1.6	0.005	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	2.3	0.007	2.3	0.007	2.3	0.007	2.3	0.007	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	2.0	0.006	2.0	0.006	2.0	0.006	2.0	0.006	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	1.8	0.005	1.8	0.005	1.8	0.005	1.8	0.005	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	2.2	0.007	2.2	0.007	2.2	0.007	2.2	0.007	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	1.4	0.004	1.4	0.004	1.4	0.004	1.4	0.004	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	1.0	0.003	1.0	0.003	1.0	0.003	1.0	0.003	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	7.4	0.020	7.4	0.020	7.4	0.020	7.4	0.020	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	1.6	0.005	1.6	0.005	1.6	0.005	1.6	0.005	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	47.4	0.134	47.4	0.134	47.4	0.134	47.4	0.134	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	1.3	0.004	1.3	0.004	1.3	0.004	1.3	0.004	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	2.4	0.007	2.4	0.007	2.4	0.007	2.4	0.007	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	27.1	0.074	27.1	0.074	10.47	0.028	1.2	0.003	Polysar	415P	Esso
16	Chloromethane	3.7	ug/L	166.9	0.470	166.9	0.470	ND(50)	0.136	5.0	0.013	Polysar	725T	RREL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	2.9	0.009	2.9	0.009	2.9	0.009	2.9	0.009	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	1.8	0.005	1.8	0.005	1.8	0.005	1.8	0.005	Polysar	Polysar	Polysar
16	Ethylene dibromide	1.0	ug/L	2.3	0.007	2.3	0.007	2.3	0.007	2.3	0.007	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 0300 - Crumb Separator flows into CO 0200
AVERAGE FLOWRATE = 2674 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
16	Methylene chloride	1.3	ug/L	39.6	0.107	39.6	0.107	ND(10)	0.027	ND(10)	0.027	Polysar	913P	913P
16	Tetrachloroethylene	1.1	ug/L	0.8	0.003	0.8	0.003	0.8	0.003	0.8	0.003	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	4.4	0.013	4.4	0.013	4.4	0.013	4.4	0.013	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	1.3	0.004	1.3	0.004	1.3	0.004	1.3	0.004	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	1.5	0.005	1.5	0.005	1.5	0.005	1.5	0.005	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	11.7	0.035	11.7	0.035	11.7	0.035	2.6	0.007	Polysar	Polysar	Esso
17	Benzene	0.5	ug/L	2384.5	6.548	2384.5	6.548	ND(10)	0.027	3.4	0.009	Polysar	2680T	Esso
17	Ethylbenzene	0.6	ug/L	1.6	0.005	1.6	0.005	1.6	0.005	1.6	0.005	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	1.5	0.005	1.5	0.005	1.5	0.005	1.5	0.005	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	26.7	0.082	26.7	0.082	12.0	0.032	5.4	0.014	Polysar	415P	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	2.6	0.008	2.6	0.008	2.6	0.008	2.6	0.008	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	13.5	0.041	13.5	0.041	13.5	0.041	13.5	0.041	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	8.5	0.026	8.5	0.026	8.5	0.026	8.5	0.026	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.4	0.004	1.4	0.004	1.4	0.004	1.4	0.004	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.003	1.1	0.003	1.1	0.003	1.1	0.003	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	31.1	*	31.1	*	31.1	*	31.1	*	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	3.0	*	3.0	*	3.0	*	3.0	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	6.4	*	6.4	*	6.4	*	6.4	*	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	4.5	*	4.5	*	4.5	*	4.5	*	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	5.8	*	5.8	*	5.8	*	5.8	*	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.7	*	2.7	*	2.7	*	2.7	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	2.4	*	2.4	*	2.4	*	2.4	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	2.1	5.117	2.1	5.117	2.1	5.117	2.1	5.117	Polysar	Polysar	Polysar

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 0300 - Crumb Separator flows into CO 0200
AVERAGE FLOWRATE = 2674 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	11	30.189	11	30.189	11	30.189	11	30.189	Polysar	Polysar	Polysar
4	Ammonia plus Ammonium	0.25	mg/L	0.16	0.427	0.16	0.427	0.16	0.427	0.16	0.427	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	0.23	0.533	0.23	0.533	0.23	0.533	0.23	0.533	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	0.866	0.3	0.866	0.3	0.866	0.3	0.866	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	4.7	12.962	4.7	12.962	4.7	12.962	4.7	12.962	Polysar	Polysar	Polysar
5	TOC	5	mg/L	5	14.377	5	14.377	5	14.377	5	14.377	Polysar	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.28	0.761	0.28	0.761	0.28	0.761	0.28	0.761	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	36	100.055	36	100.055	36	100.055	36	100.055	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	8	21.457	8	21.457	8	21.457	8	21.457	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	7649.6	21.129	7649.6	21.129	1500,0	4.011	47.0	0.126	Polysar	RREL	RREL
9	Boron	50.0	ug/L	12.5	0.035	12.5	0.035	12.5	0.035	12.5	0.035	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	468.5	1.295	468.5	1.295	80.0	0.214	80.0	0.214	Polysar	RREL	RREL
9	Molybdenum	20.0	ug/L	3.0	0.008	3.0	0.008	3.0	0.008	3.0	0.008	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.8	0.027	9.8	0.027	9.8	0.027	9.8	0.027	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	9.3	0.025	9.3	0.025	9.3	0.025	9.3	0.025	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	6.3	0.015	6.3	0.015	6.3	0.015	6.3	0.015	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-	Polysar	Polysar	Polysar
14	Phenolics (4AAP)	2.0	ug/L	10.5	0.029	10.5	0.029	10.5	0.029	10.5	0.029	Polysar	Polysar	Polysar
15	Sulphide	20.0	ug/L	37.3	0.096	37.3	0.096	37.3	0.096	37.3	0.096	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	1.6	0.005	1.6	0.005	1.6	0.005	1.6	0.005	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	2.3	0.007	2.3	0.007	2.3	0.007	2.3	0.007	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	2.0	0.006	2.0	0.006	2.0	0.006	2.0	0.006	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	1.8	0.005	1.8	0.005	1.8	0.005	1.8	0.005	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	2.2	0.007	2.2	0.007	2.2	0.007	2.2	0.007	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	1.4	0.004	1.4	0.004	1.4	0.004	1.4	0.004	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	1.0	0.003	1.0	0.003	1.0	0.003	1.0	0.003	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	7.4	0.020	7.4	0.020	7.4	0.020	7.4	0.020	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	1.6	0.005	1.6	0.005	1.6	0.005	1.6	0.005	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	47.4	0.134	47.4	0.134	47.4	0.134	47.4	0.134	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	1.3	0.004	1.3	0.004	1.3	0.004	1.3	0.004	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	2.4	0.007	2.4	0.007	2.4	0.007	2.4	0.007	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	27.1	0.074	27.1	0.074	10.47	0.028	1.2	0.003	Polysar	415P	Esso
16	Chloromethane	3.7	ug/L	166.9	0.470	166.9	0.470	ND(50)	0.136	5.0	0.013	Polysar	725T	RREL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	2.9	0.009	2.9	0.009	2.9	0.009	2.9	0.009	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	1.8	0.005	1.8	0.005	1.8	0.005	1.8	0.005	Polysar	Polysar	Polysar
16	Ethylene dibromide	1.0	ug/L	2.3	0.007	2.3	0.007	2.3	0.007	2.3	0.007	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 0300 - Crumb Separator flows into CO 0200
AVERAGE FLOWRATE = 2674 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Methylene chloride	1.3	ug/L	39.6	0.107	39.6	0.107	ND(10)	0.027	ND(10)	0.027	Polysar	913P	913P
16	Tetrachloroethylene	1.1	ug/L	0.8	0.003	0.8	0.003	0.8	0.003	0.8	0.003	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	4.4	0.013	4.4	0.013	4.4	0.013	4.4	0.013	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	1.3	0.004	1.3	0.004	1.3	0.004	1.3	0.004	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	1.5	0.005	1.5	0.005	1.5	0.005	1.5	0.005	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	11.7	0.035	11.7	0.035	11.7	0.035	2.6	0.007	Polysar	Polysar	Esso
17	Benzene	0.5	ug/L	2384.5	6.548	2384.5	6.548	ND(10)	0.027	3.4	0.009	Polysar	2680T	Esso
17	Ethylbenzene	0.6	ug/L	1.6	0.005	1.6	0.005	1.6	0.005	1.6	0.005	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	1.5	0.005	1.5	0.005	1.5	0.005	1.5	0.005	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	26.7	0.082	26.7	0.082	12.0	0.032	5.4	0.014	Polysar	415P	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	2.6	0.008	2.6	0.008	2.6	0.008	2.6	0.008	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	1.7	0.005	1.7	0.005	1.7	0.005	1.7	0.005	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	13.5	0.041	13.5	0.041	13.5	0.041	13.5	0.041	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	8.5	0.026	8.5	0.026	8.5	0.026	8.5	0.026	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.4	0.004	1.4	0.004	1.4	0.004	1.4	0.004	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.003	1.1	0.003	1.1	0.003	1.1	0.003	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	31.1	*	31.1	*	31.1	*	31.1	*	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	3.0	*	3.0	*	3.0	*	3.0	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	6.4	*	6.4	*	6.4	*	6.4	*	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	4.5	*	4.5	*	4.5	*	4.5	*	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	5.8	*	5.8	*	5.8	*	5.8	*	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.7	*	2.7	*	2.7	*	2.7	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	2.4	*	2.4	*	2.4	*	2.4	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	2.1	5.117	2.1	5.117	2.1	5.117	2.1	5.117	Polysar	Polysar	Polysar

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 0900 - Butyl II flows into CO 0400
AVERAGE FLOWRATE = 2338 M3/DAY

						BAT OPTION 1		BAT OPTION 2		BAT OPTION 3				
				12 MONTH AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	45	120.638	45	120.638	45	120.638	31.0	72.478	Polysar	Polysar	Esso
4	Ammonia plus Ammonium	0.25	mg/L	0.13	0.339	0.13	0.339	0.13	0.339	0.13	0.339	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	0.09	0.254	0.09	0.254	0.09	0.254	0.09	0.254	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.8	1.872	0.8	1.872	0.8	1.872	0.8	1.872	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	10.8	25.628	10.8	25.628	10.8	25.628	4.4	10.287	Polysar	Polysar	Esso
5	TOC	5	mg/L	13	30.578	13	30.578	13	30.578	5	11.690	Polysar	Polysar	Esso
6	Total phosphorus	0.10	mg/L	0.36	0.765	0.36	0.765	0.36	0.765	0.36	0.765	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	24	59.551	24	59.551	24	59.551	5.0	11.690	Polysar	Polysar	P1774
8	Volatile suspended solids	10	mg/L	5	12.582	5	12.582	5	12.582	5	12.582	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	3443.1	7.368	3443.1	7.368	3443.1	7.368	47.0	0.110	Polysar	Polysar	RREL
9	Boron	50.0	ug/L	17.1	0.045	17.1	0.045	17.1	0.045	17.1	0.045	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	2.3	0.006	2.3	0.006	2.3	0.006	2.3	0.006	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	3.1	0.008	3.1	0.008	3.1	0.008	3.1	0.008	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.0	0.023	9.0	0.023	9.0	0.023	9.0	0.023	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	717.9	1.623	717.9	1.623	717.9	1.623	42.0	0.098	Polysar	Polysar	RREL
10	Antimony	5.0	ug/L	4.7	0.011	4.7	0.011	4.7	0.011	4.7	0.011	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	20.0	0.063	20.0	0.063	20.0	0.063	20.0	0.063	Polysar	Polysar	Polysar
14	Phenolics (4AAP)	2.0	ug/L	9.7	0.021	9.7	0.021	9.7	0.021	9.7	0.021	Polysar	Polysar	Polysar
15	Sulphide	20.0	ug/L	127.5	0.349	127.5	0.349	127.5	0.349	2.5	0.006	Polysar	Polysar	Esso
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	20.0	0.055	20.0	0.055	20.0	0.055	20.0	0.055	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	29.4	0.077	29.4	0.077	11.2	0.026	11.2	0.026	Polysar	913P	913P
16	1,1-Dichloroethane	0.8	ug/L	24.9	0.065	24.9	0.065	ND(10)	0.023	ND(10)	0.023	Polysar	913P	913P
16	1,1-Dichloroethylene	2.8	ug/L	95.4	0.345	95.4	0.345	ND(10)	0.023	ND(10)	0.023	Polysar	913P	913P
16	1,2-Dichlorobenzene	1.4	ug/L	21.3	0.057	21.3	0.057	21.3	0.057	21.3	0.057	Polysar	Polysar^	Polysar^
16	1,2-Dichloroethane	0.8	ug/L	21.5	0.056	21.5	0.056	21.5	0.056	21.5	0.056	Polysar	Polysar^	Polysar^
16	1,2-Dichloropropane	0.9	ug/L	28.2	0.074	28.2	0.074	28.2	0.074	28.2	0.074	Polysar	Polysar^	Polysar^
16	1,3-Dichlorobenzene	1.1	ug/L	17.8	0.049	17.8	0.049	17.8	0.049	17.8	0.049	Polysar	Polysar^	Polysar^
16	1,4-Dichlorobenzene	1.7	ug/L	13.9	0.039	13.9	0.039	13.9	0.039	13.9	0.039	Polysar	Polysar^	Polysar^
16	Bromodichloromethane	0.8	ug/L	35.3	0.106	35.3	0.106	35.3	0.106	0.4	0.001	Polysar	Polysar^	Esso
16	Bromoform	3.7	ug/L	17.9	0.049	17.9	0.049	17.9	0.049	17.9	0.049	Polysar	Polysar^	Polysar^
16	Bromomethane	3.7	ug/L	4153.4	10.048	4153.4	10.048	4153.4	10.048	4153.4	10.048	Polysar	Polysar^	Polysar^
16	Carbon tetrachloride	1.3	ug/L	16.7	0.046	16.7	0.046	7.0	0.016	7.0	0.016	Polysar	RREL	RREL
16	Chlorobenzene	0.7	ug/L	29.5	0.076	29.5	0.076	29.5	0.076	29.5	0.076	Polysar	Polysar^	Polysar^
16	Chloroform	0.7	ug/L	67.7	0.210	67.7	0.210	10.47	0.024	1.20	0.003	Polysar	415T	Esso
16	Chloromethane	3.7	ug/L	56526.1	140.590	56526.1	140.590	ND(50)	0.117	5.0	0.012	Polysar	725T	RREL
16	Cis-1,3-Dichloropropylene	1.4	ug/L	35.1	0.092	35.1	0.092	35.1	0.092	35.1	0.092	Polysar	Polysar^	Polysar^
16	Dibromochloromethane	1.1	ug/L	28.3	0.075	28.3	0.075	28.3	0.075	28.3	0.075	Polysar	Polysar^	Polysar^
16	Ethylene dibromide	1.0	ug/L	29.4	0.077	29.4	0.077	29.4	0.077	29.4	0.077	Polysar	Polysar^	Polysar^

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 0900 - Butyl II flows into CO 0400
AVERAGE FLOWRATE = 2338 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Methylene chloride	1.3	ug/L	200.8	0.534	200.8	0.534	ND(10)	0.023	ND(10)	0.023	Polysar	913P	913P
16	Tetrachloroethylene	1.1	ug/L	11.0	0.033	11.0	0.033	11.0	0.033	2.1	0.005	Polysar	Polysar	Esso
16	Trans-1,2-Dichloroethylene	1.4	ug/L	21.5	0.056	21.5	0.056	21.5	0.056	21.5	0.056	Polysar	Polysar	Polysar^
16	Trans-1,3-Dichloropropylene	1.4	ug/L	53.5	0.138	53.5	0.138	53.5	0.138	53.5	0.138	Polysar	Polysar	Polysar^
16	Trichloroethylene	1.9	ug/L	16.7	0.046	16.7	0.046	ND(10)	0.023	ND(10)	0.023	Polysar	913P	913P
16	Trichlorofluoromethane	1.0	ug/L	21.5	0.065	21.5	0.065	21.5	0.065	21.5	0.065	Polysar	Polysar^	Polysar^
16	Vinyl chloride	4.0	ug/L	146.7	0.378	146.7	0.378	ND(50)	0.117	2.6	0.006	Polysar	913P	Esso
17	Benzene	0.5	ug/L	247.5	0.386	247.5	0.386	ND(10)	0.023	3.4	0.008	Polysar	2680T	Esso
17	Ethylbenzene	0.6	ug/L	19.0	0.052	19.0	0.052	19.0	0.052	19.0	0.052	Polysar	Polysar^	Polysar^
17	Styrene	0.5	ug/L	18.1	0.048	18.1	0.048	18.1	0.048	18.1	0.048	Polysar	Polysar	Polysar^
17	Toluene	0.5	ug/L	90.7	0.270	90.7	0.270	12.0	0.028	5.4	0.013	Polysar	415P	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	56.7	0.131	56.7	0.131	56.7	0.131	5.0	0.012	Polysar	Polysar^	Esso
17	o-Xylene	0.5	ug/L	37.0	0.081	37.0	0.081	37.0	0.081	2.6	0.006	Polysar	Polysar^	Esso
18	Acrolein	4.0	ug/L	150.6	0.394	150.6	0.394	ND(50)	0.117	ND(50)	0.117	Polysar	RREL	RREL^
18	Acrylonitrile	4.2	ug/L	97.0	0.256	97.0	0.256	ND(50)	0.117	ND(50)	0.117	Polysar	RREL	RREL^
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.8	0.005	1.8	0.005	1.8	0.005	1.8	0.005	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.003	1.1	0.003	1.1	0.003	1.1	0.003	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	6.1	*	6.1	*	6.1	*	6.1	*	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	3.3	*	3.3	*	3.3	*	3.3	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	3.4	*	3.4	*	3.4	*	3.4	*	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	2.6	*	2.6	*	2.6	*	2.6	*	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	5.8	*	5.8	*	5.8	*	5.8	*	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.7	*	2.7	*	2.7	*	2.7	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	2.1	*	2.1	*	2.1	*	2.1	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	5.7	13.381	5.7	13.381	5.7	13.381	5.7	13.381	Polysar	Polysar^	Polysar^

^ - No performance data available but reductions should occur based on the addition of steam stripping in Option 2 and multi-media filtration and granular activated carbon in Option 3.

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

CO 0200 - 72 inch Sewer to River
AVERAGE FLOWRATE = 67567 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	10	680.025	10	680.025	10	680.025	10	680.025	Polysar	Polysar	Polysar
4	Ammonia plus Ammonium	0.25	mg/L	0.11	8.008	0.11	8.008	0.11	8.008	0.11	8.008	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	0.34	22.638	0.34	22.638	0.34	22.638	0.34	22.638	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.3	20.466	0.3	20.466	0.3	20.466	0.3	20.466	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	2.9	199.310	2.9	199.310	2.9	199.310	2.9	199.310	Polysar	Polysar	Polysar
5	TOC	5	mg/L	7	488.471	7	488.471	7	488.471	7	488.471	Polysar	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.10	6.985	0.10	6.985	0.10	6.985	0.10	6.985	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	5	316.758	5	316.758	5	316.758	5	316.758	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	4	249.627	4	249.627	4	249.627	4	249.627	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	190.8	13.415	190.8	13.415	190.8	13.415	190.8	13.415	Polysar	Polysar	Polysar
9	Boron	50.0	ug/L	13.2	0.936	13.2	0.936	13.2	0.936	13.2	0.936	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	12.3	0.873	12.3	0.873	12.3	0.873	12.3	0.873	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	3.0	0.214	3.0	0.214	3.0	0.214	3.0	0.214	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.0	0.641	9.0	0.641	9.0	0.641	9.0	0.641	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	5.8	0.418	5.8	0.418	5.8	0.418	5.8	0.418	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	3.3	0.220	3.3	0.220	3.3	0.220	3.3	0.220	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-			
14	Phenolics (4AAP)	2.0	ug/L	3.1	0.228	3.1	0.228	3.1	0.228	3.1	0.228	Polysar	Polysar	Polysar
15	Sulphide	20.0	ug/L	32.3	2.281	32.3	2.281	32.3	2.281	32.3	2.281	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.4	0.031	0.4	0.031	0.4	0.031	0.4	0.031	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	0.6	0.042	0.6	0.042	0.6	0.042	0.6	0.042	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	0.5	0.035	0.5	0.035	0.5	0.035	0.5	0.035	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	0.5	0.036	0.5	0.036	0.5	0.036	0.5	0.036	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	0.2	0.015	0.2	0.015	0.2	0.015	0.2	0.015	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	1.6	0.112	1.6	0.112	1.6	0.112	1.6	0.112	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	0.4	0.026	0.4	0.026	0.4	0.026	0.4	0.026	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	2.3	0.164	2.3	0.164	2.3	0.164	2.3	0.164	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	0.6	0.041	0.6	0.041	0.6	0.041	0.6	0.041	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	1.4	0.100	1.4	0.100	1.4	0.100	1.4	0.100	Polysar	Polysar	Polysar
16	Chloromethane	3.7	ug/L	2.2	0.159	2.2	0.159	2.2	0.159	2.2	0.159	Polysar	Polysar	Polysar
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.7	0.048	0.7	0.048	0.7	0.048	0.7	0.048	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	0.6	0.039	0.6	0.039	0.6	0.039	0.6	0.039	Polysar	Polysar	Polysar
16	Ethylene dibromide	1.0	ug/L	0.6	0.042	0.6	0.042	0.6	0.042	0.6	0.042	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

CO 0200 - 72 inch Sewer to River
AVERAGE FLOWRATE = 67567 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV. RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Methylene chloride	1.3	ug/L	2.3	0.164	2.3	0.164	2.3	0.164	2.3	0.164	Polysar	Polysar	Polysar
16	Tetrachloroethylene	1.1	ug/L	0.2	0.015	0.2	0.015	0.2	0.015	0.2	0.015	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	1.1	0.076	1.1	0.076	1.1	0.076	1.1	0.076	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	0.3	0.023	0.3	0.023	0.3	0.023	0.3	0.023	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	2.8	0.200	2.8	0.200	2.8	0.200	2.8	0.200	Polysar	Polysar	Polysar
17	Benzene	0.5	ug/L	65.3	2.161	65.3	2.161	ND(10)	0.676	ND(10)	0.676	Polysar	2680T^	2680T^
17	Ethylbenzene	0.6	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	1.8	0.124	1.8	0.124	1.8	0.124	1.8	0.124	Polysar	Polysar	Polysar
17	m-Xylene and p-Xylene	1.1	ug/L	0.6	0.042	0.6	0.042	0.6	0.042	0.6	0.042	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	0.4	0.028	0.4	0.028	0.4	0.028	0.4	0.028	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	3.0	0.211	3.0	0.211	3.0	0.211	3.0	0.211	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	1.9	0.132	1.9	0.132	1.9	0.132	1.9	0.132	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.3	0.173	2.3	0.173	2.3	0.173	2.3	0.173	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.075	1.1	0.075	1.1	0.075	1.1	0.075	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	6.7	*	6.7	*	6.7	*	6.7	*	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	8.0	*	8.0	*	8.0	*	8.0	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	5.9	*	5.9	*	5.9	*	5.9	*	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	19.8	0.001	19.8	0.001	19.8	0.001	19.8	0.001	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	14.0	0.001	14.0	0.001	14.0	0.001	14.0	0.001	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	3.5	*	3.5	*	3.5	*	3.5	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	3.0	*	3.0	*	3.0	*	3.0	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	1.2	77.407	1.2	77.407	1.2	77.407	1.2	77.407	Polysar	Polysar	Polysar

^ - Option 2 & 3 loadings based on PR 0300 reductions

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

CO 0400 - 66 inch Sewer to River
AVERAGE FLOWRATE = 143338 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVE' AGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	9	1455.575	9	1455.575	9	1455.575	9	1455.575	Polysar	Polysar	Polysar
4	Ammonia plus Ammonium	0.25	mg/L	0.08	13.991	0.08	13.991	0.08	13.991	0.08	13.991	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	0.25	34.313	0.25	34.313	0.25	34.313	0.25	34.313	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	33.515	0.2	33.515	0.2	33.515	0.2	33.515	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	2.8	411.053	2.8	411.053	2.8	411.053	2.8	411.053	Polysar	Polysar	Polysar
5	TOC	5	mg/L	2	213.966	2	213.966	2	213.966	2	213.966	Polysar	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.10	15.011	0.10	15.011	0.10	15.011	0.10	15.011	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	4	616.704	4	616.704	4	616.704	4	616.704	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	4	576.532	4	576.532	4	576.532	4	576.532	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	96.1	14.888	96.1	14.888	96.1	14.888	96.1	14.888	Polysar	Polysar	Polysar
9	Boron	50.0	ug/L	12.9	1.981	12.9	1.981	12.9	1.981	12.9	1.981	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	2.4	0.349	2.4	0.349	2.4	0.349	2.4	0.349	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	3.0	0.451	3.0	0.451	3.0	0.451	3.0	0.451	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.0	1.355	9.0	1.355	9.0	1.355	9.0	1.355	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	17.6	2.677	17.6	2.677	17.6	2.677	17.6	2.677	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	9.0	1.306	9.0	1.306	9.0	1.306	9.0	1.306	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	10.5	1.321	10.5	1.321	10.5	1.321	10.5	1.321	Polysar	Polysar	Polysar
14	Phenolics (4AAP)	2.0	ug/L	1.4	0.211	1.4	0.211	1.4	0.211	1.4	0.211	Polysar	Polysar	Polysar
15	Sulphide	20.0	ug/L	32.5	5.280	32.5	5.280	32.5	5.280	32.5	5.280	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	3.5	0.430	3.5	0.430	3.5	0.430	3.5	0.430	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	3.6	0.518	3.6	0.518	3.6	0.518	3.6	0.518	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	2.8	0.418	2.8	0.418	2.8	0.418	2.8	0.418	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	3.9	0.594	3.9	0.594	3.9	0.594	3.9	0.594	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	3.0	0.403	3.0	0.403	3.0	0.403	3.0	0.403	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	2.5	0.366	2.5	0.366	2.5	0.366	2.5	0.366	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	3.5	0.492	3.5	0.492	3.5	0.492	3.5	0.492	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	2.7	0.351	2.7	0.351	2.7	0.351	2.7	0.351	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	2.4	0.295	2.4	0.295	2.4	0.295	2.4	0.295	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	4.4	0.676	4.4	0.676	4.4	0.676	4.4	0.676	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	2.8	0.360	2.8	0.360	2.8	0.360	2.8	0.360	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	114.9	17.992	114.9	17.992	114.9	17.992	114.9	17.992	Polysar	Polysar^	Polysar^
16	Carbon tetrachloride	1.3	ug/L	2.7	0.339	2.7	0.339	2.7	0.339	2.7	0.339	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	3.1	0.482	3.1	0.482	3.1	0.482	3.1	0.482	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	3.2	0.495	3.2	0.495	3.2	0.495	3.2	0.495	Polysar	Polysar	Polysar
16	Chloromethane	3.7	ug/L	1194.3	162.238	1194.3	162.238	ND(50)	7.167	ND(50)	7.167	Polysar	725T	725T^^
16	Cis-1,3-Dichloropropylene	1.4	ug/L	4.0	0.594	4.0	0.594	4.0	0.594	4.0	0.594	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	3.3	0.455	3.3	0.455	3.3	0.455	3.3	0.455	Polysar	Polysar	Polysar
16	Ethylene dibromide	1.0	ug/L	3.6	0.518	3.6	0.518	3.6	0.518	3.6	0.518	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

CO 0400 - 66 inch Sewer to River
AVERAGE FLOWRATE = 143338 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVE AGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Methylene chloride	1.3	ug/L	7.1	0.743	7.1	0.743	7.1	0.743	7.1	0.743	Polysar	Polysar	Polysar
16	Tetrachloroethylene	1.1	ug/L	2.8	0.298	2.8	0.298	2.8	0.298	2.8	0.298	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	2.5	0.366	2.5	0.366	2.5	0.366	2.5	0.366	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	5.4	0.850	5.4	0.850	5.4	0.850	5.4	0.850	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	2.7	0.339	2.7	0.339	2.7	0.339	2.7	0.339	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	5.4	0.584	5.4	0.584	5.4	0.584	5.4	0.584	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	15.0	2.345	15.0	2.345	15.0	2.345	15.0	2.345	Polysar	Polysar	Polysar
17	Benzene	0.5	ug/L	61.0	5.786	61.0	5.786	ND(10)	1.433	ND(10)	1.433	Polysar	2680T	2680T^^
17	Ethylbenzene	0.6	ug/L	3.2	0.409	3.2	0.409	3.2	0.409	3.2	0.409	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	2.5	0.364	2.5	0.364	2.5	0.364	2.5	0.364	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	16.1	3.068	16.1	3.068	12.0	1.720	12.0	1.720	Polysar	415P	415P^^
17	m-Xylene and p-Xylene	1.1	ug/L	4.9	0.603	4.9	0.603	4.9	0.603	4.9	0.603	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	2.5	0.366	2.5	0.366	2.5	0.366	2.5	0.366	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	17.6	3.417	17.6	3.417	17.6	3.417	17.6	3.417	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	11.2	2.164	11.2	2.164	11.2	2.164	11.2	2.164	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.3	0.319	2.3	0.319	2.3	0.319	2.3	0.319	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.166	1.1	0.166	1.1	0.166	1.1	0.166	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	113.9	0.023	113.9	0.023	113.9	0.023	113.9	0.023	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	3.1	*	3.1	*	3.1	*	3.1	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	7.5	0.001	7.5	0.001	7.5	0.001	7.5	0.001	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	5.9	0.001	5.9	0.001	5.9	0.001	5.9	0.001	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	28.7	0.005	28.7	0.005	28.7	0.005	28.7	0.005	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.8	*	2.8	*	2.8	*	2.8	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	2.3	*	2.3	*	2.3	*	2.3	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	1.2	160.873	1.2	160.873	1.2	160.873	1.2	160.873	Polysar	Polysar	Polysar

^ - No performance data available but reductions should occur based on the addition of steam stripping for BAT Option 2

^^ - BAT Option 2&3 loadings are based on PR0900 reductions

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD - SARNIA

CO 0500 - 54 inch Sewer to River
AVERAGE FLOWRATE = 169478 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	22	3562.976	22	3562.976	22	3562.976	22	3562.976	Polysar	Polysar	Polysar
4	Ammonia plus Ammonium	0.25	mg/L	0.06	8.899	0.06	8.899	0.06	8.899	0.06	8.899	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	0.33	54.405	0.33	54.405	0.33	54.405	0.33	54.405	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.2	39.235	0.2	39.235	0.2	39.235	0.2	39.235	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	2.7	466.467	2.7	466.467	2.7	466.467	2.7	466.467	Polysar	Polysar	Polysar
5	TOC	5	mg/L	4	749.606	4	749.606	4	749.606	4	749.606	Polysar	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.11	18.498	0.11	18.498	0.11	18.498	0.11	18.498	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	4	744.725	4	744.725	4	744.725	4	744.725	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	4	618.900	4	618.900	4	618.900	4	618.900	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	55.0	8.932	55.0	8.932	55.0	8.932	55.0	8.932	Polysar	Polysar	Polysar
9	Boron	50.0	ug/L	13.8	2.261	13.8	2.261	13.8	2.261	13.8	2.261	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	2.3	0.361	2.3	0.361	2.3	0.361	2.3	0.361	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	3.0	0.492	3.0	0.492	3.0	0.492	3.0	0.492	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.0	1.478	9.0	1.478	9.0	1.478	9.0	1.478	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	8.5	1.440	8.5	1.440	8.5	1.440	8.5	1.440	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	4.8	0.782	4.8	0.782	4.8	0.782	4.8	0.782	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-			
14	Phenolics (4AAP)	2.0	ug/L	2.2	0.369	2.2	0.369	2.2	0.369	2.2	0.369	Polysar	Polysar	Polysar
15	Sulphide	20.0	ug/L	40.0	6.789	40.0	6.789	40.0	6.789	40.0	6.789	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.4	0.076	0.4	0.076	0.4	0.076	0.4	0.076	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	0.6	0.103	0.6	0.103	0.6	0.103	0.6	0.103	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	0.5	0.086	0.5	0.086	0.5	0.086	0.5	0.086	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	0.4	0.070	0.4	0.070	0.4	0.070	0.4	0.070	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	0.4	0.070	0.4	0.070	0.4	0.070	0.4	0.070	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	0.4	0.069	0.4	0.069	0.4	0.069	0.4	0.069	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	0.5	0.086	0.5	0.086	0.5	0.086	0.5	0.086	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	0.3	0.053	0.3	0.053	0.3	0.053	0.3	0.053	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	0.2	0.036	0.2	0.036	0.2	0.036	0.2	0.036	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	2.8	0.486	2.8	0.486	2.8	0.486	2.8	0.486	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	0.4	0.070	0.4	0.070	0.4	0.070	0.4	0.070	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	2.3	0.405	2.3	0.405	2.3	0.405	2.3	0.405	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	0.3	0.053	0.3	0.053	0.3	0.053	0.3	0.053	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	0.6	0.102	0.6	0.102	0.6	0.102	0.6	0.102	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	5.8	1.013	5.8	1.013	5.8	1.013	5.8	1.013	Polysar	Polysar	Polysar
16	Chloromethane	3.7	ug/L	2.6	0.436	2.6	0.436	2.6	0.436	2.6	0.436	Polysar	Polysar	Polysar
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.7	0.120	0.7	0.120	0.7	0.120	0.7	0.120	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	2.6	0.443	2.6	0.443	2.6	0.443	2.6	0.443	Polysar	Polysar	Polysar
16	Ethylene dibromide	1.0	ug/L	0.6	0.103	0.6	0.103	0.6	0.103	0.6	0.103	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

CO 0500 - 54 inch Sewer to River
AVERAGE FLOWRATE = 169478 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Methylene chloride	1.3	ug/L	0.4	0.066	0.4	0.066	0.4	0.066	0.4	0.066	Polysar	Polysar	Polysar
16	Tetrachloroethylene	1.1	ug/L	0.2	0.037	0.2	0.037	0.2	0.037	0.2	0.037	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	0.4	0.069	0.4	0.069	0.4	0.069	0.4	0.069	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	1.1	0.187	1.1	0.187	1.1	0.187	1.1	0.187	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	0.3	0.053	0.3	0.053	0.3	0.053	0.3	0.053	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	0.3	0.057	0.3	0.057	0.3	0.057	0.3	0.057	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	2.8	0.493	2.8	0.493	2.8	0.493	2.8	0.493	Polysar	Polysar	Polysar
17	Benzene	0.5	ug/L	0.8	0.137	0.8	0.137	0.8	0.137	0.8	0.137	Polysar	Polysar	Polysar
17	Ethylbenzene	0.6	ug/L	0.7	0.116	0.7	0.116	0.7	0.116	0.7	0.116	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	0.4	0.069	0.4	0.069	0.4	0.069	0.4	0.069	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	2.5	0.429	2.5	0.429	2.5	0.429	2.5	0.429	Polysar	Polysar	Polysar
17	m-Xylene and p-Xylene	1.1	ug/L	0.7	0.123	0.7	0.123	0.7	0.123	0.7	0.123	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	0.4	0.069	0.4	0.069	0.4	0.069	0.4	0.069	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	3.6	0.630	3.6	0.630	3.6	0.630	3.6	0.630	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	1.9	0.327	1.9	0.327	1.9	0.327	1.9	0.327	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	1.4	0.238	1.4	0.238	1.4	0.238	1.4	0.238	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.180	1.1	0.180	1.1	0.180	1.1	0.180	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	8.2	0.001	8.2	0.001	8.2	0.001	8.2	0.001	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	3.2	*	3.2	*	3.2	*	3.2	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	4.0	0.001	4.0	0.001	4.0	0.001	4.0	0.001	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	7.9	0.001	7.9	0.001	7.9	0.001	7.9	0.001	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	4.1	*	4.1	*	4.1	*	4.1	*	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.8	*	2.8	*	2.8	*	2.8	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	2.8	*	2.8	*	2.8	*	2.8	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	1.5	263.946	1.5	263.946	1.5	263.946	1.5	263.946	Polysar	Polysar	Polysar

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

BA 1700 - Neutralization Sump to River
AVERAGE FLOWRATE = 418 M3

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVERAGE CONC	BAT OPTION 3 ANNUAL AVERAGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	18	12.514	18	12.514	18	12.514	18	12.514	Polysar	Polysar	Polysar
2	Cyanide Total	0.005	mg/L	0.004	0.005	0.004	0.005	0.004	0.005	0.004	0.005	Polysar	Polysar	Polysar
4	Ammonia plus Ammonium	0.25	mg/L	1.78	1.606	1.78	1.606	1.78	1.606	1.78	1.606	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	2.75	2.032	2.75	2.032	2.75	2.032	2.75	2.032	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	2.0	1.900	2.0	1.900	2.0	1.900	2.0	1.900	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	8.9	6.950	8.9	6.950	8.9	6.950	4.4	1.839	Polysar	Polysar	Esso
5	TOC	5	mg/L	8	7.009	8	7.009	8	7.009	5	2.090	Polysar	Polysar	Esso
6	Total phosphorus	0.10	mg/L	0.11	0.082	0.11	0.082	0.11	0.082	0.11	0.082	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	12	10.053	12	10.053	12	10.053	5	2.090	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	4	2.606	4	2.606	4	2.606	4	2.606	Polysar	Polysar	Polysar
9	Aluminum	30.0	ug/L	163.1	0.090	163.1	0.090	163.1	0.090	47.0	0.020	Polysar	Polysar	RREL
9	Boron	50.0	ug/L	65.5	0.055	65.5	0.055	65.5	0.055	65.5	0.055	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	4.7	0.004	4.7	0.004	4.7	0.004	4.7	0.004	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	3.5	0.003	3.5	0.003	3.5	0.003	3.5	0.003	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.1	0.007	9.1	0.007	9.1	0.007	9.1	0.007	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	17.1	0.011	17.1	0.011	17.1	0.011	17.1	0.011	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	17.3	0.016	17.3	0.016	17.3	0.016	17.3	0.016	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-			
14	Phenolics (4AAP)	2.0	ug/L	16.3	0.010	16.3	0.010	16.3	0.010	2.5	0.001	Polysar	Polysar	Esso
15	Sulphide	20.0	ug/L	55.0	0.026	55.0	0.026	55.0	0.026	55.0	0.026	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	2.4	0.002	2.4	0.002	2.4	0.002	2.4	0.002	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	Polysar	Polysar	Polysar
16	Chloromethane	3.7	ug/L	2.3	0.002	2.3	0.002	2.3	0.002	2.3	0.002	Polysar	Polysar	Polysar
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

BA 1700 - Neutralization Sump to River
AVERAGE FLOWRATE = 418 M3

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Ethylene dibromide	1.0	ug/L	0.6	*	0.6	*	0.6	*	0.6	*	Polysar	Polysar	Polysar
16	Methylene chloride	1.3	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Polysar	Polysar	Polysar
16	Tetrachloroethylene	1.1	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	1.1	0.001	1.1	0.001	1.1	0.001	1.1	0.001	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	0.3	*	0.3	*	0.3	*	0.3	*	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	2.9	0.002	2.9	0.002	2.9	0.002	2.6	0.001	Polysar	Polysar	Esso
17	Benzene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
17	Ethylbenzene	0.6	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
17	m-Xylene and p-Xylene	1.1	ug/L	0.5	*	0.5	*	0.5	*	0.5	*	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	0.4	*	0.4	*	0.4	*	0.4	*	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	3.0	0.002	3.0	0.002	3.0	0.002	3.0	0.002	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	1.9	0.001	1.9	0.001	1.9	0.001	1.9	0.001	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	15.1	0.010	15.1	0.010	15.1	0.010	15.1	0.010	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	2.6	0.001	2.6	0.001	2.6	0.001	2.6	0.001	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	11.1	*	11.1	*	11.1	*	11.1	*	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	2.7	*	2.7	*	2.7	*	2.7	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	3.5	*	3.5	*	3.5	*	3.5	*	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	2.5	*	2.5	*	2.5	*	2.5	*	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	1.7	*	1.7	*	1.7	*	1.7	*	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.6	*	2.6	*	2.6	*	2.6	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	2.1	*	2.1	*	2.1	*	2.1	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	3.5	2.678	3.5	2.678	3.5	2.678	3.5	2.678	Polysar	Polysar	Polysar

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 1800 - Biox Effluent to River
AVERAGE FLOWRATE = 12432 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE CONC	12 MONTH AVERAGE LOAD KG/DAY	BAT OPTION 1 ANNUAL AVERAGE CONC	BAT OPTION 1 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 2 ANNUAL AVERAGE CONC	BAT OPTION 2 ANNUAL AVERAGE LOAD KG/DAY	BAT OPTION 3 ANNUAL AVE AGE CONC	BAT OPTION 3 ANNUAL AVE AGE LOAD KG/DAY	DATA SOURCE BAT 1	DATA SOURCE BAT 2	DATA SOURCE BAT 3
1	COD	10	mg/L	69	929.999	69	929.999	69	929.999	31.0	385.392	Polysar	Polysar	Esso
4	Ammonia plus Ammonium	0.25	mg/L	1.57	19.582	1.57	19.582	1.57	19.582	1.57	19.582	Polysar	Polysar	Polysar
4	Nitrate+Nitrite	0.25	mg/L	2.15	29.014	2.15	29.014	2.15	29.014	2.15	29.014	Polysar	Polysar	Polysar
4	Total Kjeldahl Nitrogen	0.5	mg/L	2.3	29.026	2.3	29.026	2.3	29.026	2.3	29.026	Polysar	Polysar	Polysar
5	DOC	0.5	mg/L	16.7	200.134	16.7	200.134	16.7	200.134	4.4	54.701	Polysar	Polysar	Esso
5	TOC	5	mg/L	15	187.095	15	187.095	15	187.095	5.0	62.160	Polysar	Polysar	Esso
6	Total phosphorus	0.10	mg/L	0.71	8.463	0.71	8.463	0.71	8.463	0.71	8.463	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	15	189.032	15	189.032	15	189.032	5.0	62.160	Polysar	Polysar	P1774
8	Volatile suspended solids	10	mg/L	8	98.273	8	98.273	8	98.273	5.0	62.160	Polysar	Polysar	P1774
9	Aluminum	30.0	ug/L	1453.7	18.459	1453.7	18.459	1453.7	18.459	47.0	0.584	Polysar	Polysar	RREL
9	Boron	50.0	ug/L	31.6	0.388	31.6	0.388	31.6	0.388	31.6	0.388	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	2.2	0.027	2.2	0.027	2.2	0.027	2.2	0.027	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	14.9	0.184	14.9	0.184	14.9	0.184	14.9	0.184	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	23.3	0.293	23.3	0.293	23.3	0.293	23.3	0.293	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	20.0	0.249	20.0	0.249	20.0	0.249	20.0	0.249	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	5.4	0.069	5.4	0.069	5.4	0.069	5.4	0.069	Polysar	Polysar	Polysar
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-			
14	Phenolics (4AAP)	2.0	ug/L	10.1	0.113	10.1	0.113	10.1	0.113	2.5	0.031	Polysar	Polysar	Esso
15	Sulphide	20.0	ug/L	125.0	1.691	125.0	1.691	125.0	1.691	125.0	1.691	Polysar	Polysar	Polysar
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.8	0.009	0.8	0.009	0.8	0.009	0.8	0.009	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	0.9	0.010	0.9	0.010	0.9	0.010	0.9	0.010	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	0.7	0.008	0.7	0.008	0.7	0.008	0.7	0.008	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	0.7	0.007	0.7	0.007	0.7	0.007	0.7	0.007	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	0.7	0.007	0.7	0.007	0.7	0.007	0.7	0.007	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	0.6	0.007	0.6	0.007	0.6	0.007	0.6	0.007	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	0.8	0.009	0.8	0.009	0.8	0.009	0.8	0.009	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	0.6	0.006	0.6	0.006	0.6	0.006	0.6	0.006	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	0.5	0.005	0.5	0.005	0.5	0.005	0.5	0.005	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	0.7	0.008	0.7	0.008	0.7	0.008	0.4	0.005	Polysar	Polysar	Esso
16	Bromoform	3.7	ug/L	9.8	0.122	9.8	0.122	9.8	0.122	9.8	0.122	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	2.9	0.035	2.9	0.035	2.9	0.035	2.9	0.035	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	0.6	0.006	0.6	0.006	0.6	0.006	0.6	0.006	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	0.8	0.009	0.8	0.009	0.8	0.009	0.8	0.009	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	7.5	0.094	7.5	0.094	7.5	0.094	1.2	0.015	Polysar	Polysar	Esso
16	Chloromethane	3.7	ug/L	4.0	0.046	4.0	0.046	4.0	0.046	4.0	0.046	Polysar	Polysar	Polysar
16	Cis-1,3-Dichloropropylene	1.4	ug/L	1.0	0.011	1.0	0.011	1.0	0.011	1.0	0.011	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	0.9	0.010	0.9	0.010	0.9	0.010	0.9	0.010	Polysar	Polysar	Polysar
16	Ethylene dibromide	1.0	ug/L	0.9	0.010	0.9	0.010	0.9	0.010	0.9	0.010	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

PR 1800 - Biox Effluent to River
AVERAGE FLOWRATE = 12432 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AVERAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Methylene chloride	1.3	ug/L	2.1	0.019	2.1	0.019	2.1	0.019	2.1	0.019	Polysar	Polysar	Polysar
16	Tetrachloroethylene	1.1	ug/L	0.6	0.006	0.6	0.006	0.6	0.006	0.6	0.006	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	0.6	0.006	0.6	0.006	0.6	0.006	0.6	0.006	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	1.3	0.016	1.3	0.016	1.3	0.016	1.3	0.016	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	0.6	0.006	0.6	0.006	0.6	0.006	0.6	0.006	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	1.1	0.011	1.1	0.011	1.1	0.011	1.1	0.011	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	3.7	0.042	3.7	0.042	3.7	0.042	3.7	0.042	Polysar	Polysar	Polysar
17	Benzene	0.5	ug/L	1.6	0.012	1.6	0.012	1.6	0.012	1.6	0.012	Polysar	Polysar	Polysar
17	Ethylbenzene	0.6	ug/L	0.7	0.008	0.7	0.008	0.7	0.008	0.7	0.008	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	0.6	0.007	0.6	0.007	0.6	0.007	0.6	0.007	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	1.4	0.015	1.4	0.015	1.4	0.015	1.4	0.015	Polysar	Polysar	Polysar
17	m-Xylene and p-Xylene	1.1	ug/L	1.1	0.011	1.1	0.011	1.1	0.011	1.1	0.011	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	0.6	0.007	0.6	0.007	0.6	0.007	0.6	0.007	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	4.2	0.047	4.2	0.047	4.2	0.047	4.2	0.047	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	2.8	0.031	2.8	0.031	2.8	0.031	2.8	0.031	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	7.2	0.090	7.2	0.090	7.2	0.090	7.2	0.090	Polysar	Polysar	Polysar
20	2,6-Dichlorophenol	2.0	ug/L	1.1	0.014	1.1	0.014	1.1	0.014	1.1	0.014	Polysar	Polysar	Polysar
23	1,2,4-Trichlorobenzene	10.0	ng/L	15.0	*	15.0	*	15.0	*	15.0	*	Polysar	Polysar	Polysar
23	2,4,5-Trichlorotoluene	10.0	ng/L	4.8	*	4.8	*	4.8	*	4.8	*	Polysar	Polysar	Polysar
23	Hexachlorobenzene	10.0	ng/L	3.5	*	3.5	*	3.5	*	3.5	*	Polysar	Polysar	Polysar
23	Hexachlorobutadiene	10.0	ng/L	4.5	*	4.5	*	4.5	*	4.5	*	Polysar	Polysar	Polysar
23	Hexachloroethane	10.0	ng/L	6.7	*	6.7	*	6.7	*	6.7	*	Polysar	Polysar	Polysar
23	Octachlorostyrene	10.0	ng/L	2.7	*	2.7	*	2.7	*	2.7	*	Polysar	Polysar	Polysar
23	Pentachlorobenzene	10.0	ng/L	3.0	*	3.0	*	3.0	*	3.0	*	Polysar	Polysar	Polysar
25	Oil and grease	1.0	mg/L	3.8	47.183	3.8	47.183	3.8	47.183	3.8	47.183	Polysar	Polysar	Polysar

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

OT 1400 - Turbine Cooling Water to River
AVERAGE FLOWRATE = 62922 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV. RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Nitrate+Nitrite	0.25	mg/L	-	-	-	-	-	-	-	-			
4	Total Kjeldahl Nitrogen	0.5	mg/L	-	-	-	-	-	-	-	-			
5	DOC	0.5	mg/L	3.1	144.030	3.1	144.030	3.1	144.030	3.1	144.030	Polysar	Polysar	Polysar
5	TOC	5	mg/L	3	7.448	3	7.448	3	7.448	3	7.448	Polysar	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.10	7.048	0.10	7.048	0.10	7.048	0.10	7.048	Polysar	Polysar	Polysar
8	Total suspended solids	5	mg/L	7	299.740	7	299.740	7	299.740	7	299.740	Polysar	Polysar	Polysar
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	91.3	3.306	91.3	3.306	91.3	3.306	91.3	3.306	Polysar	Polysar	Polysar
9	Boron	50.0	ug/L	13.3	0.784	13.3	0.784	13.3	0.784	13.3	0.784	Polysar	Polysar	Polysar
9	Cobalt	20.0	ug/L	2.3	0.127	2.3	0.127	2.3	0.127	2.3	0.127	Polysar	Polysar	Polysar
9	Molybdenum	20.0	ug/L	3.0	0.189	3.0	0.189	3.0	0.189	3.0	0.189	Polysar	Polysar	Polysar
9	Nickel	20.0	ug/L	9.0	0.566	9.0	0.566	9.0	0.566	9.0	0.566	Polysar	Polysar	Polysar
9	Zinc	10.0	ug/L	8.3	0.586	8.3	0.586	8.3	0.586	8.3	0.586	Polysar	Polysar	Polysar
10	Antimony	5.0	ug/L	-	-	-	-	-	-	-	-			
11	Chromium (hexavalent)	10.0	ug/L	-	-	-	-	-	-	-	-			
14	Phenolics (4AAP)	2.0	ug/L	-	-	-	-	-	-	-	-			
15	Sulphide	20.0	ug/L	-	-	-	-	-	-	-	-			
16	1,1,2,2-Tetrachloroethane	4.3	ug/L	0.4	0.029	0.4	0.029	0.4	0.029	0.4	0.029	Polysar	Polysar	Polysar
16	1,1,2-Trichloroethane	0.6	ug/L	0.6	0.041	0.6	0.041	0.6	0.041	0.6	0.041	Polysar	Polysar	Polysar
16	1,1-Dichloroethane	0.8	ug/L	0.5	0.034	0.5	0.034	0.5	0.034	0.5	0.034	Polysar	Polysar	Polysar
16	1,1-Dichloroethylene	2.8	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
16	1,2-Dichlorobenzene	1.4	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
16	1,2-Dichloroethane	0.8	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
16	1,2-Dichloropropane	0.9	ug/L	0.5	0.034	0.5	0.034	0.5	0.034	0.5	0.034	Polysar	Polysar	Polysar
16	1,3-Dichlorobenzene	1.1	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	1,4-Dichlorobenzene	1.7	ug/L	0.2	0.014	0.2	0.014	0.2	0.014	0.2	0.014	Polysar	Polysar	Polysar
16	Bromodichloromethane	0.8	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
16	Bromoform	3.7	ug/L	0.4	0.025	0.4	0.025	0.4	0.025	0.4	0.025	Polysar	Polysar	Polysar
16	Bromomethane	3.7	ug/L	2.2	0.164	2.2	0.164	2.2	0.164	2.2	0.164	Polysar	Polysar	Polysar
16	Carbon tetrachloride	1.3	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	Chlorobenzene	0.7	ug/L	0.6	0.041	0.6	0.041	0.6	0.041	0.6	0.041	Polysar	Polysar	Polysar
16	Chloroform	0.7	ug/L	0.5	0.030	0.5	0.030	0.5	0.030	0.5	0.030	Polysar	Polysar	Polysar
16	Chloromethane	3.7	ug/L	2.2	0.157	2.2	0.157	2.2	0.157	2.2	0.157	Polysar	Polysar	Polysar
16	Cis-1,3-Dichloropropylene	1.4	ug/L	0.7	0.048	0.7	0.048	0.7	0.048	0.7	0.048	Polysar	Polysar	Polysar
16	Dibromochloromethane	1.1	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - POLYSAR LTD. - SARNIA

OT 1400 - Turbine Cooling Water to River
AVERAGE FLOWRATE = 62922 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
16	Ethylene dibromide	1.0	ug/L	0.6	0.041	0.6	0.041	0.6	0.041	0.6	0.041	Polysar	Polysar	Polysar
16	Methylene chloride	1.3	ug/L	0.4	0.021	0.4	0.021	0.4	0.021	0.4	0.021	Polysar	Polysar	Polysar
16	Tetrachloroethylene	1.1	ug/L	0.2	0.014	0.2	0.014	0.2	0.014	0.2	0.014	Polysar	Polysar	Polysar
16	Trans-1,2-Dichloroethylene	1.4	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
16	Trans-1,3-Dichloropropylene	1.4	ug/L	1.0	0.075	1.0	0.075	1.0	0.075	1.0	0.075	Polysar	Polysar	Polysar
16	Trichloroethylene	1.9	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	Trichlorofluoromethane	1.0	ug/L	0.3	0.021	0.3	0.021	0.3	0.021	0.3	0.021	Polysar	Polysar	Polysar
16	Vinyl chloride	4.0	ug/L	2.7	0.198	2.7	0.198	2.7	0.198	2.7	0.198	Polysar	Polysar	Polysar
17	Benzene	0.5	ug/L	0.2	0.014	0.2	0.014	0.2	0.014	0.2	0.014	Polysar	Polysar	Polysar
17	Ethylbenzene	0.6	ug/L	0.5	0.029	0.5	0.029	0.5	0.029	0.5	0.029	Polysar	Polysar	Polysar
17	Styrene	0.5	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
17	Toluene	0.5	ug/L	0.5	0.034	0.5	0.034	0.5	0.034	0.5	0.034	Polysar	Polysar	Polysar
17	m-Xylene and p-Xylene	1.1	ug/L	0.5	0.034	0.5	0.034	0.5	0.034	0.5	0.034	Polysar	Polysar	Polysar
17	o-Xylene	0.5	ug/L	0.4	0.027	0.4	0.027	0.4	0.027	0.4	0.027	Polysar	Polysar	Polysar
18	Acrolein	4.0	ug/L	2.8	0.205	2.8	0.205	2.8	0.205	2.8	0.205	Polysar	Polysar	Polysar
18	Acrylonitrile	4.2	ug/L	1.8	0.130	1.8	0.130	1.8	0.130	1.8	0.130	Polysar	Polysar	Polysar
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
20	2,6-Dichlorophenol	2.0	ug/L	-	-	-	-	-	-	-	-			
23	1,2,4-Trichlorobenzene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	2,4,5-Trichlorotoluene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachlorobenzene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachlorobutadiene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Hexachloroethane	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Octachlorostyrene	10.0	ng/L	-	-	-	-	-	-	-	-			
23	Pentachlorobenzene	10.0	ng/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	1.5	104.058	1.5	104.058	1.5	104.058	1.5	104.058	Polysar	Polysar	Polysar

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS

ROHM AND HAAS CANADA INC. - MORRISBURG SITE

1.0 PLANT DESCRIPTION

The Rohm and Haas Canada Inc. plant in Morrisburg manufactures three separate products:

- Cell Cast Plexiglas® sheeting
- Melt Calendared Plexiglas® sheeting
- Petroleum Additives

All raw water used at the plant is chlorinated municipal water supplied by the town of Morrisburg. No additives are added to the raw water supply.

Water conditioning is done on raw water used as boiler feed. Salt regeneration of the conditioner is carried out every two days and takes about 40 lbs of salt per regeneration.

Details on the plant processes, water uses, and wastewater generations and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

MISA Control Point CO 0100 (Final Outfall to River) is the only direct discharge from the plant. All wastewaters generated at the plant including once-through cooling water and stormwater runoff are collected through a series of three sewer lines and directed to the Combined Sewer (CO 0100) before being discharged to the St. Lawrence River. During the MISA Twelve Month Monitoring Period, only the Combined Sewer (MISA Control Point CO 0100) and the Oil Additives Process Effluent (MISA Control Point PR 0200) which flows into the Combined Sewer were monitored.

Table 1.0 presents the sources of wastewater for those two points.

TABLE 1.0 MISA MONITORED DISCHARGES AT ROHM AND HAAS	
Monitoring Location	Contributing Sources
PR 0200 (flows into CO 0100)	· OTCW from oil additives area · Washwater from pump pads and floor drains at oil additives area · Steam condensate from oil additives area · Steam condensate from NW Tanks area · Stormwater from NW Tank Farm and Petroleum Chemical area
CO 0100	· OTCW from Mix Tank and After Cooler in Plexiglas® Casting area · OTCW from Plexiglas® Melt Calendar area · Effluent from sanitary treatment tank · Blowdown and backflush water from the Boiler House/Water Treatment area · Stormwater runoff from the Plexiglas® plant roof drains and the southeast property areas

In addition to these two discharges, there are two stormwater discharge points which terminate in a swamp on the west side of the Rohm and Haas property. The stormwater discharge points drain runoff water from the west side of the developed property. Both stormwater discharge points were monitored during the MISA Monitoring Period, but since there are no direct discharge points to the St. Lawrence River from the on-site swamp, they were not considered in this study.

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled, and submitted by the plant to the Ministry of the Environment at MISA Twelve Month Monitoring Period at MISA Control Point CO 0100 showed that the plant's only direct discharge was not acutely lethal. No toxicity data were collected at MISA Control Point PR 0200. As a result, no additional treatment is recommended for this option.

3.2 BAT OPTION 2

This BAT Option incorporates the best available technologies from similar U.S. or Ontario plants that if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report showed that the plant's current pollutant discharge levels are as low or lower than the discharge levels at similar organic chemical manufacturing plants in the U.S. and Ontario with the exception of toluene and COD. Toluene was detected at an average concentration of 51.5 ug/l and 85.3 ug/l at MISA Control Points PR 0200 and CO 0100, respectively. COD was detected at an average concentration of 87 mg/l and 128 mg/l at MISA Control Points PR 0200 and CO 0100, respectively.

The sources of COD and toluene in the effluents are unknown, and since the concentration of those pollutants in the combined effluent (MISA Control Point CO 0100) is higher than the concentration observed in the process sewer (MISA Control Point PR 0200), granular activated carbon and multi-media filtration are recommended at MISA Control Point CO 0100.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would provide the equivalent of virtual elimination and zero discharge of contaminants. Based on the projected effluent concentrations for BAT Option 2, no additional treatment is recommended for this option.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for this plant.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR ROHM AND HAAS - MORRISBURG PLANT

BAT OPTION	DEFINITION	DESCRIPTION
1	Non-lethal Effluent	No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	Granular Activated Carbon and Multimedia Filtration (CO 0100)
3	Zero Discharge/Virtual Elimination	Same as BAT Option 2

4.0 PERFORMANCE DATA OF SELECTED BAT OPTIONS

Appendix B of this report presents the projected effluent concentrations and loadings resulting from implementation of all three BAT Options. Current performance data are also presented for purposes of comparison. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST ESTIMATES

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Rohm and Haas, Morrisburg were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 2).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for Rohm and Haas, Morrisburg. The only cost estimates are for granular activated carbon and multimedia filtration at MISA Control Point CO 0100 for BAT Option 2. Cost estimates for development and implementation of a BMP plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES[1]
ROHM AND HAAS CANADA INC. - MORRISBURG SITE

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 2 and 3		
		CAPITAL	O&M	TECHNOLOGY
CO 0100	830	576,400 1,309,800 1,886,200	52,600 961,700 1,014,300	FIL GAC TOTAL

NOTES:

(1) There is no cost associated with BAT Option 1
FIL Multimedia Filtration
GAC Granular Activated Carbon

6.0 REFERENCES

1. Rohm and Haas Canada Inc. - Morrisburg Plant. BAT Status of the OCM Sector Plants Site Visit Information Report, March 21, 1991.

2. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987)

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR ROHM AND HAAS CANADA INC. - MORRISBURG

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – ROHM AND HAAS CANADA INC. – MORRISBURG

ATG	PARAMETER	RMDL	UNIT	IN 0500	PR 0200	CO 0100
1	COD	10	mg/L	–	87	128
2	Cyanide Total	0.005	mg/L	–	0.005	0.005
3	Hydrogen ion (pH)			–	8.0	7.9
4	Ammonia plus Ammonium	0.25	mg/L	–	0.09	0.44
4	Nitrate+Nitrite	0.25	mg/L	–	0.21	0.28
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	0.7	1.1
5	DOC	0.5	mg/L	0.9	6.4	9.9
5	TOC	5	mg/L	–	–	16
6	Total phosphorus	0.10	mg/L	–	0.11	0.21
7	Specific conductance	5	uS/cm	–	331	438
8	Total suspended solids	5	mg/L	–	4	7
8	Volatile suspended solids	10	mg/L	–	4	4
9	Aluminum	30.0	ug/L	–	28.9	32.1
9	Copper	10.0	ug/L	–	6.3	15.9
9	Zinc	10.0	ug/L	–	6.8	12.8
14	Phenolics (4AAP)	2.0	ug/L	–	5.9	3.8
15	Sulphide	20.0	ug/L	–	30.4	42.3
16	Bromodichloromethane	0.8	ug/L	10.9	3.2	3.7
16	Chloroform	0.7	ug/L	16.8	6.6	17.8
16	Dibromochloromethane	1.1	ug/L	3.7	2.1	1.5
17	Ethylbenzene	0.6	ug/L	0.4	2.4	0.9
17	Toluene	0.5	ug/L	0.4	51.5	85.3
17	m–Xylene and p–Xylene	1.1	ug/L	0.5	8.5	3.0
17	o–Xylene	0.5	ug/L	0.4	6.6	2.7
25	Oil and grease	1.0	mg/L	–	2.1	1.7
98	Ftflow		m3/day	654	351	645

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS:
IN 0500 – Intake Water to Site
PR 0200 – Oil Additives Process Effluent flows into CO 0100
CO 0100 – Final Outfall to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – ROHM AND HAAS CANADA INC. – MORRISBURG

ATG	PARAMETER	IN 0500	PR 0200	CO 0100	TOTAL
1	COD	–	22.344	88.288	88.288
2	Cyanide Total	–	0.002	0.004	0.004
4	Ammonia plus Ammonium	–	0.031	0.330	0.330
4	Nitrate+Nitrite	–	0.074	0.194	0.194
4	Total Kjeldahl Nitrogen	–	0.236	0.796	0.796
5	DOC	0.615	2.214	6.149	6.149
5	TOC	–	–	9.065	9.065
6	Total phosphorus	–	0.039	0.146	0.146
8	Total suspended solids	–	1.353	4.094	4.094
8	Volatile suspended solids	–	1.200	2.770	2.770
9	Aluminum	–	0.008	0.023	0.023
9	Copper	–	0.002	0.011	0.011
9	Zinc	–	0.002	0.009	0.009
14	Phenolics (4AAP)	–	0.002	0.003	0.003
15	Sulphide	–	0.011	0.031	0.031
16	Bromodichloromethane	0.007	0.001	0.003	0.003
16	Chloroform	0.010	0.002	0.012	0.012
16	Dibromochloromethane	0.002	0.001	0.001	0.001
17	Ethylbenzene	*	0.001	*	*
17	Toluene	*	0.021	0.063	0.063
17	m–Xylene and p–Xylene	*	0.003	0.002	0.002
17	o–Xylene	*	0.002	0.001	0.001
25	Oil and grease	–	0.778	1.213	1.213

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0500 – Intake Water to Site
PR 0200 – Oil Additives Process Effluent flows into CO 0100
CO 0100 – Final Outfall to River

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
ROHM AND HAAS CANADA INC. - MORRISBURG

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ROHM AND HAAS CANADA INC. - MORRISBURG

CONTROL POINT - PR 0200 Oil Additives Process Effluent flows into CO 0100
AVERAGE FLOWRATE = 351 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	87	22.344	87	22.344	87	22.344	87	22.344	Treated in	CO 0100	
2	Cyanide Total	0.005	mg/L	0.005	0.002	0.005	0.002	0.005	0.002	0.005	0.002		"	
4	Ammonia plus Ammonium	0.25	mg/L	0.09	0.031	0.09	0.031	0.09	0.031	0.09	0.031		"	
4	Nitrate+Nitrite	0.25	mg/L	0.21	0.074	0.21	0.074	0.21	0.074	0.21	0.074		"	
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.7	0.236	0.7	0.236	0.7	0.236	0.7	0.236		"	
5	DOC	0.5	mg/L	6.4	2.214	6.4	2.214	6.4	2.214	6.4	2.214		"	
5	TOC	5	mg/L	-	-	-	-	-	-	-	-			
6	Total phosphorus	0.10	mg/L	0.11	0.039	0.11	0.039	0.11	0.039	0.11	0.039	Treated in	CO 0100	
8	Total suspended solids	5	mg/L	4	1.353	4	1.353	4	1.353	4	1.353		"	
8	Volatile suspended solids	10	mg/L	4	1.200	4	1.200	4	1.200	4	1.200		"	
9	Aluminum	30.0	ug/L	28.9	0.008	28.9	0.008	28.9	0.008	28.9	0.008		"	
9	Copper	10.0	ug/L	6.3	0.002	6.3	0.002	6.3	0.002	6.3	0.002		"	
9	Zinc	10.0	ug/L	6.8	0.002	6.8	0.002	6.8	0.002	6.8	0.002		"	
14	Phenolics (4AAP)	2.0	ug/L	5.9	0.002	5.9	0.002	5.9	0.002	5.9	0.002		"	
15	Sulphide	20.0	ug/L	30.4	0.011	30.4	0.011	30.4	0.011	30.4	0.011		"	
16	Bromodichloromethane	0.8	ug/L	3.2	0.001	3.2	0.001	3.2	0.001	3.2	0.001		"	
16	Chloroform	0.7	ug/L	6.6	0.002	6.6	0.002	6.6	0.002	6.6	0.002		"	
16	Dibromochloromethane	1.1	ug/L	2.1	0.001	2.1	0.001	2.1	0.001	2.1	0.001		"	
17	Ethylbenzene	0.6	ug/L	2.4	0.001	2.4	0.001	2.4	0.001	2.4	0.001		"	
17	Toluene	0.5	ug/L	51.5	0.021	51.5	0.021	51.5	0.021	51.5	0.021		"	
17	m-Xylene and p-Xylene	1.1	ug/L	8.5	0.003	8.5	0.003	8.5	0.003	8.5	0.003		"	
17	o-Xylene	0.5	ug/L	6.6	0.002	6.6	0.002	6.6	0.002	6.6	0.002		"	
25	Oil and grease	1.0	mg/L	2.1	0.778	2.1	0.778	2.1	0.778	2.1	0.778		"	

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ROHM AND HAAS CANADA INC. - MORRISBURG

CONTROL POINT CO 0100 - Final Outfall to River
AVERAGE FLOWRATE = 645 M3/DAY

						BAT OPTION 1		BAT OPTION 2		BAT OPTION 3		DATA SOURCE		
				12 MONTH AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		ANNUAL AV RAGE				
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	128	88.288	128	88.288	31	19.995	31	19.995	R&H-M	Esso	Esso
2	Cyanide Total	0.005	mg/L	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004	R&H-M	R&H-M	R&H-M
4	Ammonia plus Ammonium	0.25	mg/L	0.44	0.330	0.44	0.330	0.44	0.330	0.44	0.330	R&H-M	R&H-M	R&H-M
4	Nitrate+Nitrite	0.25	mg/L	0.28	0.194	0.28	0.194	0.28	0.194	0.28	0.194	R&H-M	R&H-M	R&H-M
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.1	0.796	1.1	0.796	1.1	0.796	1.1	0.796	R&H-M	R&H-M	R&H-M
5	DOC	0.5	mg/L	9.9	6.149	9.9	6.149	4.4	2.838	4.4	2.838	R&H-M	Esso	Esso
5	TOC	5	mg/L	16	9.065	16	9.065	5	3.225	5	3.225	R&H-M	Esso	Esso
6	Total phosphorus	0.10	mg/L	0.21	0.146	0.21	0.146	0.21	0.146	0.21	0.146	R&H-M	R&H-M	R&H-M
8	Total suspended solids	5	mg/L	7	4.094	7	4.094	5	3.225	5	3.225	R&H-M	P1774	P1774
8	Volatile suspended solids	10	mg/L	4	2.770	4	2.770	4	2.770	4	2.770	R&H-M	R&H-M	R&H-M
9	Aluminum	30.0	ug/L	32.1	0.023	32.1	0.023	32.1	0.023	32.1	0.023	R&H-M	R&H-M	R&H-M
9	Copper	10.0	ug/L	15.9	0.011	15.9	0.011	15.9	0.011	15.9	0.011	R&H-M	R&H-M	R&H-M
9	Zinc	10.0	ug/L	12.8	0.009	12.8	0.009	12.8	0.009	12.8	0.009	R&H-M	R&H-M	R&H-M
14	Phenolics (4AAP)	2.0	ug/L	3.8	0.003	3.8	0.003	2.5	0.002	2.5	0.002	R&H-M	Esso	Esso
15	Sulphide	20.0	ug/L	42.3	0.031	42.3	0.031	42.3	0.031	42.3	0.031	R&H-M	R&H-M	R&H-M
16	Bromodichloromethane	0.8	ug/L	3.7	0.003	3.7	0.003	0.4	*	0.4	*	R&H-M	Esso	Esso
16	Chloroform	0.7	ug/L	17.8	0.012	17.8	0.012	1.2	0.001	1.2	0.001	R&H-M	Esso	Esso
16	Dibromochloromethane	1.1	ug/L	1.5	0.001	1.5	0.001	1.5	0.001	1.5	0.001	R&H-M	R&H-M	R&H-M
17	Ethylbenzene	0.6	ug/L	0.9	*	0.9	*	0.9	*	0.9	*	R&H-M	R&H-M	R&H-M
17	Toluene	0.5	ug/L	85.3	0.063	85.3	0.063	5.4	0.003	5.4	0.003	R&H-M	Esso	Esso
17	m-Xylene and p-Xylene	1.1	ug/L	3.0	0.002	3.0	0.002	3.0	0.002	3.0	0.002	R&H-M	R&H-M	R&H-M
17	o-Xylene	0.5	ug/L	2.7	0.001	2.7	0.001	2.6	0.001	2.6	0.001	R&H-M	Esso	Esso
25	Oil and grease	1.0	mg/L	1.7	1.213	1.7	1.213	1.7	1.213	1.7	1.213	R&H-M	R&H-M	R&H-M

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR REPORT ON BAT OPTIONS

ROHM AND HAAS CANADA INC. - WEST HILL PLANT

1.0 PLANT DESCRIPTION

The Rohm and Haas Canada Inc., West Hill plant is located on the north shore of Lake Ontario, in east Scarborough. The plant was constructed in 1954, and underwent expansions in 1964 and 1978. There are 175 people working at the facility. The plant operates 24 hours per day, 5 days per week with three 8 hour shifts.

The plant manufactures acrylic and vinyl acetate emulsions for use in the manufacturing of coatings, paints, floor polishes, adhesives and fabric coatings. In addition, the plant produces a soya oil emulsion which is used in food packaging.

There is only one MISA Control Point at Rohm and Haas: OT 0100. At this control point, in addition to storm sewer discharges, emergency once-through non-contact cooling water may be discharged. Emergency discharge occurs when the chillers malfunction. The emergency cooling water is discharged to a gully to the west of the plant. From the gully, the wastewater flows into Lake Ontario.

All the process water and washwater is pH treated in an on-site process settling lagoon and discharged to the municipal sanitary sewer system.

Rohm and Haas is considering installing a vapour detector system in the storm sewer system so that the inflatable "pig" used to stop discharge from the storm sewer system could be automatically inflated in the event of a process spill. Construction of a large stormwater retention pond is also being considered.

Details on the plant processes, water uses, and wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

There are three main sewer systems. The sanitary sewer system, connected directly to municipal sewer system, is used to collect all domestic wastewater. The process sewer drains direct contact wastewater

to the process settling lagoon. After neutralization, the lagoon effluent is discharged to the municipal sanitary sewer system.

The storm sewers are located outdoors in areas where contamination should not occur. The storm sewer discharges to a gully to the west of the plant which drains directly into Lake Ontario (MISA Control Point OT 0100).

All other process water is discharged directly to the on-site process settling lagoon or collected for off-site disposal. Wastewater that has been transferred to the process settling lagoon is neutralized prior to discharge to the municipal sanitary sewer. Wastewater that is contaminated with soya oil or crank case oil is isolated and stored on-site. This wastewater is collected approximately once each year for off-site disposal.

The following are sources of wastewater directed to the on-site process settling lagoon:

- process line and vessel washwater
- boiler blowdown
- steam condensate
- chiller blowdown
- spent scrubber liquor
- washwater from floor and external equipment washings

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION CONSIDERATIONS

The plant is a zero direct water discharger under normal operating conditions. Water for non-contact process cooling is chilled and recirculated to a storage tank.

In cases of emergencies, such as power failures or chiller malfunctions, the plant would require municipal water for once-through cooling to ensure safe shutdown of processes. The emergency cooling water would then be discharged directly to Lake Ontario. Only six such discharges occurred during the one year monitoring period.

Because the plant is a zero direct discharger, no further consideration for BAT implementation was required.

4.0 REFERENCES

1. Rohm and Haas Canada Inc. Scarborough Site BAT Status of the OCM Sector Plant Site Visit Information Report, March 11, 1991.

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR ROHM AND HAAS CANADA INC. - WEST HILL PLANT

OCM SECTOR TWELVE MONTH REPORT – DATA FROM FEB 1/90 TO JAN 31/91

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES AND TOTAL LOADING PER YEAR
PLANT SITE – ROHM AND HAAS CANADA INC. – SCARBOROUGH

					OT 0100	
ATG	PARAMETER	RMDL	UNIT	IN 0300	AVERAGE CONC PER EVENT	TOTAL LOADING (kg / year)
1	COD	10	mg/L	–	–	–
2	Cyanide Total	0.005	mg/L	–	0.032	0.074
3	Hydrogen ion (pH)			–	8.0	
4	Ammonia plus Ammonium	0.25	mg/L	–	0.19	0.435
4	Nitrate+Nitrite	0.25	mg/L	–	29.05	66.535
4	Total Kjeldahl Nitrogen	0.5	mg/L	–	1.8	4.204
5	DOC	0.5	mg/L	–	16.2	37.072
5	TOC	5	mg/L	–	–	–
6	Total phosphorus	0.10	mg/L	–	0.07	0.156
7	Specific conductance	500	uS/cm	–	618	
8	Total suspended solids	5	mg/L	–	5	10.691
8	Volatile suspended solids	10	mg/L	–	4	8.019
9	Aluminum	30.0	ug/L	–	142.0	0.326
9	Zinc	10.0	ug/L	–	15.5	0.035
14	Phenolics (4AAP)	2.0	ug/L	–	4.2	0.011
25	Oil and grease	1.0	mg/L	–	2.0	4.588
98	Ftflow		m3/day	–	1309	
	Total Discharge Period		hours		42	
	Total Volume Discharged		m3/year		2290	
	Number of Discharge Events				6	

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation.
(ii) Average concentration values for parameters in ATGs 1, 3 to 8 and 25 are reported even if the parameter did not qualify as "found" at the site.
(iii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.

SAMPLING POINTS
IN 0300 – Intake Water to Site
OT 0100 – Sewer to Lake

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
ROHM AND HAAS CANADA INC. - WEST HILL PLANT

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - ROHM AND HAAS CANADA INC. - SCARBOROUGH

CONTROL POINT - OT 0100 Storm Sewer to River*

				12 MONTH AVERAGL	
ATG	PARAMETER	RMDL	UNIT	CONC PER EVENT	LOAD KG/YEAR
1	COD	10	mg/L	-	-
2	Cyanide Total	0.005	mg/L	0.032	0.074
4	Ammonia plus Ammonium	0.25	mg/L	0.19	0.435
4	Nitrate+Nitrite	0.25	mg/L	29.50	66.535
4	Total kjeldahl nitrogen	0.5	mg/L	1.8	4.204
5	DOC	0.5	mg/L	16.2	37.072
5	TOC	5	mg/L	-	-
6	Total phosphorus	0.10	mg/L	0.07	0.156
8	Total suspended solids	5	mg/L	5	10.691
8	Volatile suspended solids	10	mg/L	4	8.019
9	Aluminum	30.0	ug/L	142.0	0.326
9	Zinc	10.0	ug/L	15.5	0.035
14	Phenolics (4AAP)	2.0	ug/L	4.2	0.011
25	Oil and grease	1.0	mg/L	2.0	4.588

* Total discharge events during year = 6
Total volume discharged during year = 2290 cubic meters

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Amprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcom	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

**ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS**

STEPAN CANADA INC.

1.0 PLANT DESCRIPTION

Stepan Canada, Inc. is located in Longford Mills, Ontario on the southwestern shore of Lake St. John. The original site was used as a saw mill during the late 1800's. In the early 1900's, charcoal from the destructive distillation of wood was manufactured at the site. In the 1920's, the manufacture of chemicals at the site was begun and has continued to the present. Stepan Canada purchased the facility in the fall of 1989 from Domtar, Inc.

Stepan manufactures mainly phosphate-free detergents, wetting agents, foam stabilizers, emulsifying agents, nonylphenol, and other similar cleaning products. The products ultimately find their way into the consumer marketplace for use by individuals as dishwash and laundry detergents and a variety of personal care products.

Most processes utilize batch reactors. Production levels are geared to final product sales. Although some product is sold directly to customers who do their own final product formulating, much of the overall production is formulated with water, dyes, perfumes, and additives to customer specification before shipment in bulk. No packaging for consumers is performed at this plant. Product is shipped in tank trucks, drums and, to a limited extent, tank cars.

Process effluents, boiler blowdown and stormwater are directed to a biological treatment system. Non-contact cooling water joins the treatment plant effluent (MISA Control Point PR 0200) and both are being discharged through a single outfall to Lake St. John (MISA Control Point CO 0100).

Details on the plant processes, water uses, wastewater generation, and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

Process effluents, boiler blowdown, stormwater, and steam condensate are collected and directed to a biological treatment plant for treatment. The treatment plant effluent (MISA Control Point PR 0200) is combined with once-through, non-contact cooling water before being discharged to Lake St. John (MISA Control Point CO 0100).

Table 1.0 presents a summary of the wastewater sources at MISA Control Points PR 0200 and CO 0100.

TABLE 1.0
SOURCES OF WASTEWATER AT MISA MONITORED CONTROL POINTS

MISA CONTROL POINT	DESCRIPTION	DESCRIPTION OF WASTEWATER SOURCES
PR 0200	Clarifier Effluent (Flows into CO 0100)	· Process wastewater · Stormwater runoff · Boiler blowdown · Steam condensate (during the winter)
CO 0200	Combined Effluent	· Clarifier effluent (PR 0200) · Once-through, non-contact cooling water

2.2 WASTEWATER FLOW AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for monitoring at MISA Control Points PR 0200 and CO 0100.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and achieves the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options are addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled, and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period showed that the plant's combined final effluent (MISA Control Point CO 0100) was not acutely lethal. Toxicity data were not collected at the clarifier effluent (MISA Control Point PR 0200). As a result, no additional treatment is recommended for BAT Option 1.

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that if installed, will achieve the maximum overall pollutant reduction. The draft analytical results obtained from the MISA OCM Sector Twelve Month Report showed elevated concentrations of some conventional pollutants and metals for the clarifier effluent (MISA Control Point PR 0200).

Elevated metals concentrations in the clarifier effluent included boron, copper, and zinc. However, the effluent concentrations of these pollutants were present at levels comparable to the levels in the intake water. This indicates that contamination is not introduced in the process.

Technologies for the removal of low levels of contaminants contributed in raw water present in these effluents may be available and have been used in specific non-industrial applications (i.e., drinking water treatment). However, practical applications of these technologies in treating industrial wastewater effluent with similar contaminant concentrations could not be identified. Thus, BAT Option 2 does not include technologies for the removal of these contaminants.

High levels of COD (201 mg/l), DOC (31.2 mg/l), and TOC (34 mg/l) were also found in the clarifier effluent. Upgrades of the existing biological treatment system are the recommended method of control for the above-mentioned pollutants for BAT Option 2. Methods by which biological treatment systems in the OCPSF industry may modify their existing facilities to upgrade and improve performance include

adding unit treatment processes; modifying the design and operational parameters of existing units, acclimating existing bacteria to certain toxicants and nutrient addition (Ref. 2).

Elevated levels of polychlorinated biphenyls (PCBs) have also been detected at MISA Control Point PR 0200. Since PCBs are not one of the contaminants that appear to be related to the plant's processes, it may originate in stormwater or cooling water; therefore, identification of PCB sources and methods of control is recommended under a Best Management Practices (BMPs) study. A draft report prepared by Environment Canada provides guidelines for developing a BMP plan (Ref. 3).

Contaminant levels found at the final effluent (MISA Control Point CO 0100) are low (comparable to intake water levels); improvements in PR 0200 will remove the major contaminant source and therefore, no additional treatment is recommended for BAT Option 2.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants. A search which included current technology or combination of current technologies including supplemental/add-on technologies or cross-over technologies from other industrial sectors was carried out as part of this study. Based on the contaminants present in the plant effluents and the results of this search, granular activated carbon and multimedia filtration are recommended for MISA Control Point CO 0100. Since the clarifier effluent (PR 0200) flows into CO 0100, no additional treatment is recommended for PR 0200 under this option.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT options recommended for Stepan Canada, Inc. for MISA Control Points PR 0200 and CO 0100.

TABLE 2.0 SUMMARY OF BAT OPTIONS FOR STEPAN CANADA INC.		
BAT OPTION	**DEFINITION**	**DESCRIPTION**
A. MISA CONTROL POINT PR 0200		
1	Non-lethal effluent	· No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· Biological Treatment Upgrades · BMPs (PCBs)
3	Zero Discharge/Virtual Elimination	· Same as BAT Option 2
B. MISA CONTROL POINT CO 0100		
1	Non-lethal effluent	· No additional treatment
2	USA/Ontario BAT/Maximum Pollutant Reduction	· No additional treatment
3	Zero Discharge/Virtual Elimination	· Granular Activated Carbon · Multimedia Filtration

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and cannot be easily estimated on an industry wide basis. The average flow rate as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste-specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals and materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Stepan Canada Inc. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987) (Ref. 2).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Options for Stepan Canada Inc. The only cost estimates are for granular activated carbon at MISA Control Point CO 0100 and biological treatment upgrades at MISA Control Point PR 0200. Cost estimates for development and implementation of a BMP Plan could not be developed due to the site-specific nature of the plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
STEPAN CANADA INC.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
PR 0200	175	0	0	NAT	11,300	3,200	BTU	0	0	NAT
CO 0100	2,982	0	0	NAT	0	0	NAT	7,432,900 862,700 8,295,600	478,300 72,300 550,600	GAC FIL TOTAL

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
BTU - Biological Treatment Upgrades
FIL - Multimedia Filtration

6.0 REFERENCES

1. Stepan Canada Inc. - BAT Status of OCM Sector Plants Site Visit Information Report, April 26, 1991.

2. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

3. J.S. Shrives, Oil, Gas & Energy Division, Industrial Programs Branch, Environmental Protection, Environment Canada, "Best Management Practices (BMPs) and Their Application to Ontario's MISA Program", May 1987.

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR STEPAN CANADA INC.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – STEPAN CANADA INC. – LONGFORD MILLS

ATG	PARAMETER	RMDL	UNIT	IN 0600	PR 0200	CO 0100
1	COD	10	mg/L	22	150	37
2	Cyanide Total	0.005	mg/L	0.005	0.005	0.005
3	Hydrogen ion (pH)			–	6.8	7.5
4	Ammonia plus Ammonium	0.25	mg/L	0.08	1.43	0.20
4	Nitrate+Nitrite	0.25	mg/L	0.10	0.54	0.17
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.6	4.8	1.0
5	DOC	0.5	mg/L	9.1	36.1	8.6
5	TOC	5	mg/L	12	39	8
6	Total phosphorus	0.10	mg/L	0.03	0.23	0.10
7	Specific conductance	5	uS/cm	187	3035	432
8	Total suspended solids	5	mg/L	1	12	5
8	Volatile suspended solids	10	mg/L	1	9	1
9	Aluminum	30.0	ug/L	47.3	837.7	97.7
9	Boron	50.0	ug/L	35.3	58.0	37.3
9	Copper	10.0	ug/L	5.8	10.0	6.8
9	Nickel	20.0	ug/L	12.5	23.8	14.2
9	Zinc	10.0	ug/L	27.5	46.0	20.5
11	Chromium (hexavalent)	10.0	ug/L	7.0	18.4	5.5
14	Phenolics (4AAP)	2.0	ug/L	5.7	15.6	2.5
15	Sulphide	20.0	ug/L	20.0	30.5	25.3
16	Carbon tetrachloride	1.3	ug/L	0.4	5.1	0.4
16	Chloroform	0.7	ug/L	0.7	7.9	1.4
25	Oil and grease	1.0	mg/L	1.7	11.0	3.6
27	PCBT	0.1	ug/L	0.1	30.0	0.1
98	Ftflow		m3/day	–	140	2440

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" at the site.

SAMPLING POINTS:
IN 0600 – Intake Water to Site
PR 0200 – Clarifier Effluent flows into CO 0100
CO 0100 – Effluent to Lake

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – STEPAN CANADA INC. – LONGFORD MILLS

ATG	PARAMETER	IN 0600	PR 0200	CO 0100	TOTAL
1	COD	58.930	17.837	97.500	97.500
2	Cyanide Total	0.013	0.001	0.012	0.012
4	Ammonia plus Ammonium	0.229	0.184	0.539	0.539
4	Nitrate+Nitrite	0.273	0.075	0.406	0.406
4	Total Kjeldahl Nitrogen	1.750	0.629	2.484	2.484
5	DOC	23.737	4.943	21.076	21.076
5	TOC	31.448	5.338	19.494	19.494
6	Total phosphorus	0.098	0.031	0.242	0.242
8	Total suspended solids	3.349	1.645	12.626	12.626
8	Volatile suspended solids	2.965	1.299	3.492	3.492
9	Aluminum	0.125	0.117	0.248	0.248
9	Boron	0.096	0.008	0.095	0.095
9	Copper	0.015	0.001	0.017	0.017
9	Nickel	0.032	0.003	0.035	0.035
9	Zinc	0.080	0.006	0.052	0.052
11	Chromium (hexavalent)	0.019	0.003	0.014	0.014
14	Phenolics (4AAP)	0.016	0.002	0.006	0.006
15	Sulphide	0.053	0.004	0.065	0.065
16	Carbon tetrachloride	0.001	0.001	0.001	0.001
16	Chloroform	0.002	0.001	0.003	0.003
25	Oil and grease	4.640	1.591	8.598	8.598
27	PCBT	*	0.003	*	*

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 0600 – Intake Water to Site
CO 0100 – Effluent to Lake
PR 0200 – Clarifier Effluent flows into CO 0100

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS FOR STEPAN CANADA INC.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - STEPAN CANADA INC. - LONGFORD MILLS

CONTROL POINT - PR 0200 Clarifier Effluent flows into CO 0100
AVERAGE FLOWRATE = 140 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	150	17.837	150	17.837	69	9.660	69	9.660	Stepan	Polysar	Polysar
2	Cyanide Total	0.005	mg/L	0.005	0.001	0.005	0.001	0.005	0.001	0.005	0.001	Stepan	Stepan	Stepan
4	Ammonia plus Ammonium	0.25	mg/L	1.43	0.184	1.43	0.184	1.43	0.184	1.43	0.184	Stepan	Stepan	Stepan
4	Nitrate+Nitrite	0.25	mg/L	0.54	0.075	0.54	0.075	0.54	0.075	0.54	0.075	Stepan	Stepan	Stepan
4	Total Kjeldahl Nitrogen	0.5	mg/L	4.8	0.629	4.8	0.629	2.3	0.322	2.3	0.322	Stepan	Polysar	Polysar
5	DOC	0.5	mg/L	36.1	4.943	36.1	4.943	16.7	2.338	16.7	2.338	Stepan	Polysar	Polysar
5	TOC	5	mg/L	39	5.338	39	5.338	15	2.100	15	2.100	Stepan	Polysar	Polysar
6	Total phosphorus	0.10	mg/L	0.23	0.031	0.23	0.031	0.23	0.031	0.23	0.031	Stepan	Stepan	Stepan
8	Total suspended solids	5	mg/L	12	1.645	12	1.645	12	1.645	12	1.645	Stepan	Stepan	Stepan
8	Volatile suspended solids	10	mg/L	9	1.299	9	1.299	9	1.299	9	1.299	Stepan	Stepan	Stepan
9	Aluminum	30.0	ug/L	837.7	0.117	837.7	0.117	837.7	0.117	837.7	0.117	Stepan	Stepan	Stepan^
9	Boron	50.0	ug/L	58.0	0.008	58.0	0.008	58.0	0.008	58.0	0.008	Stepan	Stepan	Stepan
9	Copper	10.0	ug/L	10.0	0.001	10.0	0.001	10.0	0.001	10.0	0.001	Stepan	Stepan	Stepan
9	Nickel	20.0	ug/L	23.8	0.003	23.8	0.003	23.8	0.003	23.8	0.003	Stepan	Stepan	Stepan
9	Zinc	10.0	ug/L	46.0	0.006	46.0	0.006	46.0	0.006	46.0	0.006	Stepan	Stepan	Stepan
11	Chromium (hexavalent)	10.0	ug/L	18.4	0.003	18.4	0.003	18.4	0.003	18.4	0.003	Stepan	Stepan	Stepan
14	Phenolics (4AAP)	2.0	ug/L	15.6	0.002	15.6	0.002	10.1	0.001	10.1	0.001	Stepan	Polysar	Polysar
15	Sulphide	20.0	ug/L	30.5	0.004	30.5	0.004	30.5	0.004	30.5	0.004	Stepan	Stepan	Stepan
16	Carbon tetrachloride	1.3	ug/L	5.1	0.001	5.1	0.001	0.6	*	0.6	*	Stepan	Polysar	Polysar
16	Chloroform	0.7	ug/L	7.9	0.001	7.9	0.001	7.5	0.001	7.5	0.001	Stepan	Polysar	Polysar
25	Oil and grease	1.0	mg/L	11.0	1.591	11.0	1.591	3.8	0.532	3.8	0.532	Stepan	Polysar	Polysar
27	PCBT	0.1	ug/L	30.0	0.003	30.0	0.003	30.0	0.003	30.0	0.003	Stepan	Stepan	Stepan^

^ - Treated at CO 0100

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - STEPAN CANADA INC. - LONGFORD MILLS

CONTROL POINT - CO 0100 Effluent to Lake
AVERAGE FLOWRATE = 2440 M3/DAY

						BAT OPTION 1		BAT OPTION 2		BAT OPTION 3				
				12 MONTH AVERAGE		ANNUAL AVERAGE		ANNUAL AVERAGE		ANNUAL AV RAGE		DATA SOURCE		
				CONC	LOAD	CONC	LOAD	CONC	LOAD	CONC	LOAD			
ATG	PARAMETER	RMDL	UNIT		KG/DAY		KG/DAY		KG/DAY		KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	37	97.500	37	97.500	37	97.500	31	75.640	Stepan	Stepan	Esso
2	Cyanide Total	0.005	mg/L	0.005	0.012	0.005	0.012	0.005	0.012	0.005	0.012	Stepan	Stepan	Stepan
4	Ammonia plus Ammonium	0.25	mg/L	0.20	0.539	0.20	0.539	0.20	0.539	0.20	0.539	Stepan	Stepan	Stepan
4	Nitrate+Nitrite	0.25	mg/L	0.17	0.406	0.17	0.406	0.17	0.406	0.17	0.406	Stepan	Stepan	Stepan
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.0	2.484	1.0	2.484	1.0	2.484	1.0	2.484	Stepan	Stepan	Stepan
5	DOC	0.5	mg/L	8.6	21.076	8.6	21.076	8.6	21.076	4.4	10.736	Stepan	Stepan	Esso
5	TOC	5	mg/L	8	19.494	8	19.494	8	19.494	5	12.200	Stepan	Stepan	Esso
6	Total phosphorus	0.10	mg/L	0.10	0.242	0.10	0.242	0.10	0.242	0.10	0.242	Stepan	Stepan	Stepan
8	Total suspended solids	5	mg/L	5	12.626	5	12.626	5	12.626	5	12.626	Stepan	Stepan	Stepan
8	Volatile suspended solids	10	mg/L	1	3.492	1	3.492	1	3.492	1	3.492	Stepan	Stepan	Stepan
9	Aluminum	30.0	ug/L	97.7	0.248	97.7	0.248	97.7	0.248	47.0	0.115	Stepan	Stepan	RREL
9	Boron	50.0	ug/L	37.3	0.095	37.3	0.095	37.3	0.095	37.3	0.095	Stepan	Stepan	Stepan
9	Copper	10.0	ug/L	6.8	0.017	6.8	0.017	6.8	0.017	6.8	0.017	Stepan	Stepan	Stepan
9	Nickel	20.0	ug/L	14.2	0.035	14.2	0.035	14.2	0.035	14.2	0.035	Stepan	Stepan	Stepan
9	Zinc	10.0	ug/L	20.5	0.052	20.5	0.052	20.5	0.052	20.5	0.052	Stepan	Stepan	Stepan
11	Chromium (hexavalent)	10.0	ug/L	5.5	0.014	5.5	0.014	5.5	0.014	5.5	0.014	Stepan	Stepan	Stepan
14	Phenolics (4AAP)	2.0	ug/L	2.5	0.006	2.5	0.006	2.5	0.006	2.5	0.006	Stepan	Stepan	Stepan
15	Sulphide	20.0	ug/L	25.3	0.065	25.3	0.065	25.3	0.065	25.3	0.065	Stepan	Stepan	Stepan
16	Carbon tetrachloride	1.3	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Stepan	Stepan	Stepan
16	Chloroform	0.7	ug/L	1.4	0.003	1.4	0.003	1.4	0.003	1.2	0.003	Stepan	Stepan	Esso
25	Oil and grease	1.0	mg/L	3.6	8.598	3.6	8.598	3.6	8.598	3.6	8.598	Stepan	Stepan	Stepan
27	PCBT	0.1	ug/L	0.1	*	0.1	*	0.1	*	0.1	*	Stepan	Stepan	Stepan

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study

**ONTARIO ORGANIC CHEMICAL MANUFACTURING (OCM) SECTOR
REPORT ON BAT OPTIONS**

UNIROYAL CHEMICAL LTD.

1.0 PLANT DESCRIPTION

The Uniroyal Chemical plant, located in Elmira, manufactures a diverse range of specialty organic chemicals and polymers, including rubber chemicals, liquid urethane prepolymers, agricultural pesticides, antioxidants/antiozonants, water treatment chemicals, a synthetic oil stabilizer, and food flavoring additives.

The facility has been in operation as a chemical manufacturing location since 1941. Initially, production centered on chemicals utilized in rubber formulations. Over the years, the product mix has shifted and currently, the agricultural fumigant and fungicide products are the most important products at this site.

Process effluents are treated by wet air oxidation, dissolved air flotation, above-ground mechanical aeration, activated carbon, and ultra-violet oxidation prior to discharge to the Elmira Sanitary Treatment Plant.

Once-through cooling water and stormwater from yard access are discharged directly to Canagagigue Creek through three outfalls. The facility also ships a quantity of liquid wastes off-site for treatment or incineration.

Details on the plant processes, water uses, wastewater generation and management are presented in the site visit report (Ref. 1).

2.0 WASTEWATER SOURCES AND QUALITY

2.1 WASTEWATER SOURCES

As indicated earlier, Uniroyal presently discharges only once-through cooling water and surface stormwater runoff directly through three outfalls:

a) MISA Control Point OT 0200 - Outfall #2 to River
b) MISA Control Point CO 0800 - Shirt Factory Greek outfall
c) MISA Control Point CO 0900 - Outfall #11 to River

MISA Control Point CO 0600 which was monitored during the first six months of MISA monitoring has been plugged with an inflatable bladder and Building #37, which contributed cooling water to this discharge, is now supplied by a cooling tower. Surface drainage from this building is being redirected to MISA Control Point CO 0800.

Table 1.0 presents a summary of wastewater sources at each of the plant's direct discharges.

TABLE 1.0
SOURCES AND DESTINATIONS OF COOLING WATERS AT UNIROYAL, ELMIRA

Source	Type	Rate (m^3/d)	Destination
Building 13	Softener Blowdown	4.5 - 6.8	Shirt Factory Creek to CO 0800
	Cooling Water from Canagagigue Creek	655	Shirt Factory Creek to CO 0800
Building 14		227	To Building 28 for Reuse
Building 15	Glycol Cooling System	6.8 - 10.5	CO 0900
	Softener Blowdown	6.8 - 7.7	CO 0900
	Cooling Tower	91 - 159	To Process Cooling
Building 18 and 19	--	386 - 409	OT 0200
Building 28	From Building 14	227	Shirt Factory Creek to CO 0800
	Other	568	Shirt Factory Creek to CO 0800
Building 33	Cooling Tower	700	To Process Cooling
Building 36	--	14	CO 0800 - when operated
Building 37	Cooling Tower	NA	To Distribution

2.2 WASTEWATER FLOWS AND QUALITY

Appendix A of this report presents the draft analytical results as obtained from the MISA OCM Sector Twelve Month Report for MISA Control Points OT 0200, CO 0800, and CO 0900. Draft analytical results from MISA Control Point CO 0600, which is currently not in use, are also presented since this outfall was in operation during the MISA Twelve Month Monitoring Period.

3.0 RATIONALE FOR SELECTION OF BAT OPTIONS

In accordance with the study requirements, the following three BAT Options for management of wastewater were considered for each Ontario OCM Sector plant:

Option 1 - A least-cost BAT Option that achieves a non-lethal effluent to Rainbow Trout and Daphnia Magna.

Option 2 - A BAT Option(s) selected by the U.S. EPA for comparable BAT facilities in the U.S. and/or a BAT Option that uses the best technology currently in use in Ontario and will achieve the maximum overall pollutant reduction.

Option 3 - A BAT Option consisting of any current technology or combination of current technologies, including technology from other industrial sectors, which will advance the Ontario plant the furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants.

Each of these options is addressed in the following subsections.

3.1 BAT OPTION 1

Toxicity data collected, compiled and submitted by the plant to the Ministry of the Environment for the MISA Twelve Month Monitoring Period at MISA Control Points OT 0200 and CO 0800 were determined to be acutely lethal to Rainbow Trout and Daphnia Magna. MISA Control Point CO 0900 was determined to be not acutely lethal to Rainbow Trout and Daphnia Magna. Data collected from the MISA Control Point CO 0600 (which has been closed) were also found to be acutely lethal.

An assessment of both the toxicity and effluent concentration data by MOE's Aquatic Toxicity Unit indicated that the cause(s) of toxicity were not conclusive and more data will be needed before an assessment can be made (Ref. 2). Based on these results, a Toxicity Investigation Evaluation (TIE) study is recommended for MISA Control Points OT 0200 and CO 0800 to assess the toxicity problems identified. Since MISA Control Point CO 0600 is no longer in use, no further investigation is recommended.

A series of guidance documents for conducting Toxicity Reduction Evaluations (TREs) are available from the U.S. Environmental Protection Agency (Ref. 3).

3.2 BAT OPTION 2

BAT Option 2 incorporates the best available technologies from similar U.S. and Ontario plants that, if installed, will achieve the maximum overall pollutant reduction.

3.2.1 Outfall #2 to River (MISA Control Point OT 0200)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point OT 0200 showed that the plant's current pollutant discharge levels are as low or lower than discharge levels at similar organic chemical manufacturing plants in the U.S. and Ontario, and therefore, no additional treatment is recommended for BAT Option 2.

3.2.2 Shirt Factory Creek Outfall (MISA Control Point CO 0800

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report from MISA Control Point CO 0800 showed elevated levels of phenolics (7.3 ug/l) and toluene (10.4 ug/l).

MISA Control Point CO 0800 consists of the flow associated with Shirt Factory Creek which provides surface drainage for part of the Town of Elmira. The creek crosses the Uniroyal property in an underground conduit. Uniroyal discharges non-contact cooling water and surface drainage at a number of points to Shirt Factory Creek. The discharge is sampled at the outlet of the conduit just before it joins Canagagigue Creek. Monitoring data obtained from the MISA monitoring taken from the Shirt Factory Creek at a point where it just enters Uniroyal property (MISA Control Point IN 1100) showed that the intake water levels for most of the contaminants were in fact comparable and in some instances higher than the effluent levels measured at the effluent, with the exception of phenolics (4AAP) and toluene.

Technologies for the removal of low levels of contaminants contributed in raw water present in these effluent may be available and have been used in specific non-industrial applications (e.g., drinking water treatment); however, practical applications of these technologies to treating industrial wastewater effluents with similar contaminant concentrations could not be identified. The sources of phenolics (4AAP) and toluene in the effluents are unknown and it is likely that these pollutants are contributed from stormwater runoff or a contaminated once-through cooling water source; therefore, the main focus should be the development and implementation of a Best Management Practices (BMP) plan to identify the sources and suggest methods of controls for those two pollutants. A draft report prepared by Environment Canada provides guidelines for developing a Best Management Practices (BMP) plan (Ref. 4).

3.2.3 Outfall #11 to River (MISA Control Point CO 0900)

The draft analytical results obtained from the MISA OCM Sector Twelve Month Report for MISA Control Point CO 0900 showed elevated concentrations of phenolics (9.3 ug/l), toluene (229.1 ug/l), and octachlorodibenzofuran (450.3 pq/l). Granular activated carbon and multimedia filtration have been demonstrated to provide reduction for these pollutants. Therefore, granular activated carbon and multimedia filtration is recommended under BAT Option 2 for MISA Control Point CO 0900.

3.3 BAT OPTION 3

BAT Option 3 incorporates those technologies that would move the plant furthest toward virtual elimination and the ultimate goal of zero discharge of contaminants including current technologies or a combination of current technologies including supplemental/add-on technologies or cross-over technologies from other industrial sectors. Based on the contaminants present in the plant effluents and the pollutant reduction expected to be achieved with the installation of the technologies recommended for BAT Option 2, no additional technologies are recommended for BAT Option 3.

3.4 SUMMARY OF BAT OPTIONS

Table 2.0 presents a summary of the BAT Options recommended for Uniroyal Chemical Ltd. for MISA Control Points OT 0200, CO 0800, and CO 0900.

TABLE 2.0
SUMMARY OF BAT OPTIONS FOR UNIROYAL CHEMICAL LTD.

BAT OPTION	DEFINITION	DESCRIPTION
A. MISA CONTROL POINT OT 0200 (Outfall #2 to River)		
1	Non-lethal effluent	· Toxicity Investigation Evaluation (TIE)
2	USA/Ontario BAT/ Maximum Pollutant Reduction	· No Additional Treatment
3	Zero Discharge/Virtual Elimination	· No Additional Treatment
B. MISA CONTROL POINT CO 0800 (Shirt Factory Creek Outfall)		
1	Non-lethal effluent	· Toxicity Investigation Evaluation (TIE)

2	USA/Ontario BAT/ Maximum Pollutant Reduction	· BMPs (phenolics, toluene)
3	Zero Discharge/Virtual Elimination	· Same as BAT Option 2
C. MISA CONTROL POINT CO 0900 (Outfall #11 to River)		
1	Non-lethal effluent	· No Additional Treatment
2	USA/Ontario BAT/ Maximum Pollutant Reduction	· Granular Activated Carbon · Multimedia Filtration
3	Zero Discharge/Virtual Elimination	· Same as BAT Option 2

4.0 SELECTED BAT OPTIONS PERFORMANCE DATA

Appendix B of this report presents the projected performance data resulting from the implementation of the recommended BAT Options. Current performance data are also presented for comparison purposes. The source of the effluent concentration data for each BAT option is also included in Appendix B.

5.0 BAT OPTIONS COST DATA

The following section presents the cost estimates associated with each control and treatment technology considered for each BAT Option. All costs presented in this section are based upon 1991 Canadian dollars and are presented as capital investment and annual operating and maintenance (O&M) costs. The cost estimates do not include land cost since the cost of land is almost exclusively dependent upon site-specific considerations and can not be easily estimated on an industry-wide basis. The average flow rate as obtained from the MISA OCM Sector Twelve Month Report plus one standard deviation was used as the design flow to estimate compliance costs from previously developed cost curves. It should also be noted that the compliance costs presented in this section are only order of magnitude estimates and depending upon site-specific or waste- specific considerations, actual costs may be higher or lower.

Capital investment cost estimates include equipment costs, installation, design engineering, contingencies and retrofitting. Annual operating and maintenance cost estimates include maintenance and operating labor, power and energy consumption, chemicals, materials, administrative costs and taxes and insurance.

The source of the cost estimates associated with the control technologies considered for Uniroyal Chemical Ltd. were taken from the cost curves developed in the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 87) (Ref. 5).

Table 3.0 presents the cost estimates for the technologies selected for each BAT Option for Uniroyal Chemical Ltd. The cost estimates generated are for granular activated carbon and multimedia filtration at MISA Control Point CO 0900. Cost estimates for development and implementation of a TIE study for MISA Control Points CO 0800 and OT 0200 and BMP plan for MISA Control Point CO 0800 could not be developed due to the site-specific nature of the study and plan.

TABLE 3.0
BAT OPTION MODELS COST ESTIMATES
UNIROYAL CHEMICALS LTD.

MISA CONTROL POINT	DESIGN FLOW m^3/day	BAT OPTION 1			BAT OPTION 2			BAT OPTION 3		
		CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY	CAPITAL	O&M	TECHNOLOGY
OT 0200	1,226	NA	NA	TIE	0	0	NAT	0	0	NAT
CO 0800	4,940	NA	NA	TIE	NA	NA	BMPs	NA	NA	BMPs
CO 0900	436	0	0	NAT	794,700	512,900	GAC	1,292,000	558,900	Same as BAT Option 2
					497,300	46,000	FIL			
					1,292,000	558,900	TOTAL			

NOTES:

NAT - No additional treatment
GAC - Granular Activated Carbon
FIL - Multimedia Filtration
NA - Cost Estimates not developed
BMPs - Best Management Practices

6.0 REFERENCES

1. Uniroyal Chemical Ltd. - BAT Status of OCM Sector Plants Site Visit Information Report, March 27-28, 1991.

2. Lee, J.T., Logan, C.S., Mueller, M.C., Poirier, D.G., Westlake, G.F.; "Acute Lethality Data for Ontario's Organic Chemical Manufacturing Sector Effluents Covering the Period from October 1989 to March 1990"; Aquatic Toxicity Unit, Limnology Section, Water Resources Branch, Ministry of the Environment (September 1991).

3. Technical Support Document for Water Quality-Based Toxics Control - Section 5.8 - "Toxicity Reduction Evaluations" EPA 505/2-90-001, March 1991.

4. J.G. Sh[illegible]es, Oil, Gas & Energy, Division of Industrial Program Branch, Environmental Protection, Environment Canada, May 1987 "Best Management Practices (BMP) and their application to Ontario's MISA Program"

5. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals Plastics and Synthetic Fibers Point Source Category (EPA 440/1-87/009, October 1987).

APPENDIX A

MISA OCM SECTOR MONITORING DATA FOR UNIROYAL CHEMICAL LTD.

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – UNIROYAL CHEMICAL LTD. – ELMIRA

ATG	PARAMETER	RMDL	UNIT	IN 1000	IN 1100	CO 0600	CO 0800	CO 0900	OT 0200
1	COD	10	mg/L	9	–	14	11	24	–
2	Cyanide Total	0.005	mg/L	0.001	0.003	0.001	0.002	0.002	–
3	Hydrogen ion (pH)			8.0	7.9	8.0	8.0	8.3	7.8
4	Ammonia plus Ammonium	0.25	mg/L	0.54	2.56	0.11	0.42	0.19	0.08
4	Nitrate+Nitrite	0.25	mg/L	6.75	5.46	1.95	5.15	1.69	4.50
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.3	2.8	0.7	1.1	0.8	2.1
5	DOC	0.5	mg/L	7.0	10.0	5.4	7.3	6.1	4.6
5	TOC	5	mg/L	9	9	5	6	7	3
6	Total phosphorus	0.10	mg/L	0.91	0.49	0.39	0.20	0.16	0.10
7	Specific conductance	5	uS/cm	594	1780	799	1193	1109	689
8	Total suspended solids	5	mg/L	29	26	4	12	11	10
8	Volatile suspended solids	10	mg/L	4	–	4	4	4	–
9	Aluminum	30.0	ug/L	171.6	41.7	9.3	140.1	160.5	48.3
9	Boron	50.0	ug/L	22.8	69.5	40.8	36.0	35.8	42.8
9	Copper	10.0	ug/L	24.4	10.2	5.0	5.8	11.0	16.8
9	Zinc	10.0	ug/L	156.6	17.8	30.5	59.8	38.7	10.5
12	Mercury	0.10	ug/L	0.11	0.04	0.24	0.05	0.08	0.07
14	Phenolics (4AAP)	2.0	ug/L	0.9	4.2	7.4	7.3	9.3	3.4
15	Sulphide	20.0	ug/L	24.5	60.0	29.5	44.8	37.3	–
16	Bromodichloromethane	0.8	ug/L	0.8	0.4	0.5	0.5	0.4	–
16	Chloroform	0.7	ug/L	0.8	0.4	0.7	0.6	1.2	–
16	Methylene chloride	1.3	ug/L	0.3	0.3	2.9	0.3	0.4	–
17	Benzene	0.5	ug/L	1.2	0.2	0.4	0.4	0.4	0.2
17	Toluene	0.5	ug/L	0.4	0.4	4.7	10.4	229.1	0.7
19	Bis(2–ethylhexyl) phthalate	2.2	ug/L	1.4	–	19.0	2.0	5.1	–

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE CONCENTRATION VALUES
PLANT SITE – UNIROYAL CHEMICAL LTD. – ELMIRA

ATG	PARAMETER	RMDL	UNIT	IN 1000	IN 1100	CO 0600	CO 0800	CO 0900	OT 0200
24	2,3,7,8 TCDD	20.0	pg/L	11.0	11.0	11.0	11.0	78.8	–
24	Total TCDD	20.0	pg/L	11.0	11.0	11.0	11.0	95.5	–
24	Total TCDF	15.0	pg/L	7.5	7.5	7.5	7.5	133.8	–
24	Total PCDF	15.0	pg/L	13.0	13.0	13.0	13.0	89.8	–
24	Total H6CDD	30.0	pg/L	22.0	22.0	20.8	21.6	81.0	–
24	Total H6CDF	20.0	pg/L	15.0	15.0	15.0	15.0	108.0	–
24	Total H7CDD	30.0	pg/L	17.0	17.0	17.0	17.8	159.3	–
24	Total H7CDF	30.0	pg/L	20.0	20.0	20.0	20.0	475.0	–
24	Octachlorodibenzo–p–dioxin	30.0	pg/L	20.0	20.0	20.0	24.7	132.5	–
24	Octachlorodibenzofuran	30.0	pg/L	22.0	22.0	22.0	22.8	450.3	–
25	Oil and grease	1.0	mg/L	2.9	11.2	1.2	1.6	2.8	1.7
98	Ftflow		m3/day	1393	3895	421	2390	252	721

EXPLANATORY NOTES:
(i) "–" no concentration data available or not required by regulation
(ii) The average concentration of a parameter that did not qualify as "found" at a given sampling point is shown in smaller size.
(iii) Average concentration values for parameters in ATGs 1–8 and 25 are reported even if the parameter did not qualify as "found" a

SAMPLING POINTS
IN 1000 – Intake Water to Site (Municipal or Canagagigue Creek)
IN 1100 – Shirt Factory Creek to Site
CO 0600 – Outfall #6 to River
CO 0800 – Shirt Factory Creek from Site
CO 0900 – Outfall #11 to River
OT 0200 – Outfall #2 to River

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT

TWELVE MONTH AVERAGE LOADING VALUES (kg/day)

PLANT SITE – UNIROYAL CHEMICAL LTD. – ELMIRA

ATG	PARAMETER	IN 1000	IN 1100	CO 0600	CO 0900	OT 0200	TOTAL	@@ CO 0800
1	COD	–	–	5.303	6.332	–	11.635	16.524
2	Cyanide Total	0.001	0.007	0.001	*	–	0.001	0.003
4	Ammonia plus Ammonium	0.748	2.234	0.016	0.047	0.062	0.125	0.564
4	Nitrate+Nitrite	9.411	15.728	0.551	0.402	3.036	3.989	11.713
4	Total Kjeldahl Nitrogen	1.857	5.116	0.227	0.234	0.507	0.968	2.199
5	DOC	9.783	32.193	2.212	1.725	2.301	6.238	14.677
5	TOC	12.599	289.938	0.167	1.522	4.126	5.815	21.059
6	Total phosphorus	1.268	0.807	0.271	0.049	0.089	0.409	0.349
8	Total suspended solids	40.126	69.526	1.469	2.853	7.949	12.271	32.173
8	Volatile suspended solids	4.877	–	1.849	1.017	–	2.866	4.682
9	Aluminum	0.239	0.084	0.003	0.064	0.057	0.124	0.363
9	Boron	0.032	0.090	0.014	0.009	0.031	0.054	0.077
9	Copper	0.034	0.018	0.002	0.003	0.027	0.032	0.013
9	Zinc	0.218	0.029	0.003	0.011	0.009	0.023	0.231
12	Mercury	*	*	*	*	*	*	*
14	Phenolics (4AAP)	0.001	0.004	0.001	0.002	0.003	0.006	0.013
15	Sulphide	0.034	0.150	0.010	0.010	–	0.02	0.059
16	Bromodichloromethane	0.001	0.001	*	*	–	*	0.001
16	Chloroform	0.001	0.001	*	*	–	*	0.001
16	Methylene chloride	*	0.001	0.002	*	–	0.002	0.001
17	Benzene	0.002	0.001	*	*	*	*	0.001
17	Toluene	0.001	0.001	0.001	0.042	*	0.043	0.028
19	Bis(2–ethylhexyl) phthalate	0.002	–	0.001	0.002	–	0.003	0.003

OCM SECTOR TWELVE MONTH REPORT – DATA FROM OCT 01/89 TO SEPT 30/90

PARAMETERS FOUND AT EACH SAMPLING POINT
TWELVE MONTH AVERAGE LOADING VALUES (kg/day)
PLANT SITE – UNIROYAL CHEMICAL LTD. – ELMIRA

ATG	PARAMETER	IN 1000	IN 1100	CO 0600	CO 0900	OT 0200	TOTAL	@@ CO 0800
24	2,3,7,8 TCDD	*	*	*	*	–	*	*
24	Total TCDD	*	*	*	*	–	*	*
24	Total TCDF	*	*	*	*	–	*	*
24	Total PCDF	*	*	*	*	–	*	*
24	Total H6CDD	*	*	*	*	–	*	*
24	Total H6CDF	*	*	*	*	–	*	*
24	Total H7CDD	*	*	*	*	–	*	*
24	Total H7CDF	*	*	*	*	–	*	*
24	Octachlorodibenzo–p–dioxin	*	*	*	*	–	*	*
24	Octachlorodibenzofuran	*	*	*	*	–	*	*
25	Oil and grease	4.063	10.338	0.457	0.973	1.087	2.517	3.718

EXPLANATORY NOTES:
(i) "–" not required by regulation or no conc/flow data available
(ii) "*" loading less than 1 gram/day

SAMPLING POINTS:
IN 1000 – Intake Water to Site (Municipal or Canagagigue Creek)
IN 1100 – Shirt Factory Creek to Site
CO 0600 – Outfall #6 to River
CO 0900 – Outfall #11 to River
OT 0200 – Outfall #2 to River
@@ CO 0800 – Shirt Factory Creek from Site – not included in the total loading for the site

APPENDIX B

PERFORMANCE DATA FOR SELECTED BAT OPTIONS
UNIROYAL CHEMICAL LTD.

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - UNIROYAL CHEMICAL LTD. - ELMIRA

CONTROL POINT - CO 0800 Shirt Factory Creek from Site
AVERAGE FLOWRATE = 2390 M3/DAY

ATG	PARAMETER	RMDL	UNIT	12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
				CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	11	16.524	11	16.524	11	16.524	11	16.524	Uniroy	Uniroy	Uniroy
2	Cyanide Total	0.005	mg/L	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.003	Uniroy	Uniroy	Uniroy
4	Ammonia plus Ammonium	0.25	mg/L	0.42	0.564	0.42	0.564	0.42	0.564	0.42	0.564	Uniroy	Uniroy	Uniroy
4	Nitrate+Nitrite	0.25	mg/L	5.15	11.713	5.15	11.713	5.15	11.713	5.15	11.713	Uniroy	Uniroy	Uniroy
4	Total Kjeldahl Nitrogen	0.5	mg/L	1.1	2.199	1.1	2.199	1.1	2.199	1.1	2.199	Uniroy	Uniroy	Uniroy
5	DOC	0.5	mg/L	7.3	14.677	7.3	14.677	7.3	14.677	7.3	14.677	Uniroy	Uniroy	Uniroy
5	TOC	5	mg/L	6	21.059	6	21.059	6	21.059	6	21.059	Uniroy	Uniroy	Uniroy
6	Total phosphorus	0.10	mg/L	0.20	0.349	0.20	0.349	0.20	0.349	0.20	0.349	Uniroy	Uniroy	Uniroy
8	Total suspended solids	5	mg/L	12	32.173	12	32.173	12	32.173	5	32.173	Uniroy	Uniroy	Uniroy
8	Volatile suspended solids	10	mg/L	4	4.682	4	4.682	4	4.682	4	4.682	Uniroy	Uniroy	Uniroy
9	Aluminum	30.0	ug/L	140.1	0.363	140.1	0.363	140.1	0.363	140.1	0.363	Uniroy	Uniroy	Uniroy
9	Boron	50.0	ug/L	36.0	0.077	36.0	0.077	36.0	0.077	36.0	0.077	Uniroy	Uniroy	Uniroy
9	Copper	10.0	ug/L	5.8	0.013	5.8	0.013	5.8	0.013	5.8	0.013	Uniroy	Uniroy	Uniroy
9	Zinc	10.0	ug/L	59.8	0.231	59.8	0.231	59.8	0.231	59.8	0.231	Uniroy	Uniroy	Uniroy
12	Mercury	0.10	ug/L	0.05	*	0.05	*	0.05	*	0.05	*	Uniroy	Uniroy	Uniroy
14	Phenolics (4AAP)	2.0	ug/L	7.3	0.013	7.3	0.013	7.3	0.013	7.3	0.013	Uniroy	Uniroy	Uniroy
15	Sulphide	20.0	ug/L	44.8	0.059	44.8	0.059	44.8	0.059	44.8	0.059	Uniroy	Uniroy	Uniroy
16	Bromodichloromethane	0.8	ug/L	0.5	0.001	0.5	0.001	0.5	0.001	0.4	0.001	Uniroy	Uniroy	Uniroy
16	Chloroform	0.7	ug/L	0.6	0.001	0.6	0.001	0.6	0.001	0.6	0.001	Uniroy	Uniroy	Uniroy
16	Methylene chloride	1.3	ug/L	0.3	0.001	0.3	0.001	0.3	0.001	0.3	0.001	Uniroy	Uniroy	Uniroy
17	Benzene	0.5	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Uniroy	Uniroy	Uniroy
17	Toluene	0.5	ug/L	10.4	0.028	10.4	0.028	10.4	0.028	10.4	0.028	Uniroy	Uniroy	Uniroy
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	2.0	0.003	2.0	0.003	2.0	0.003	2.0	0.003	Uniroy	Uniroy	Uniroy
24	2,3,7,8 TCDD	20.0	pg/L	11.0	*	11.0	*	11.0	*	11.0	*	Uniroy	Uniroy	Uniroy
24	Total TCDD	20.0	pg/L	11.0	*	11.0	*	11.0	*	11.0	*	Uniroy	Uniroy	Uniroy
24	Total TCDF	15.0	pg/L	7.5	*	7.5	*	7.5	*	7.5	*	Uniroy	Uniroy	Uniroy
24	Total PCDF	15.0	pg/L	13.0	*	13.0	*	13.0	*	13.0	*	Uniroy	Uniroy	Uniroy
24	Total H6CDD	30.0	pg/L	21.6	*	21.6	*	21.6	*	21.6	*	Uniroy	Uniroy	Uniroy
24	Total H6CDF	20.0	pg/L	15.0	*	15.0	*	15.0	*	15.0	*	Uniroy	Uniroy	Uniroy
24	Total H7CDD	30.0	pg/L	17.8	*	17.8	*	17.8	*	17.8	*	Uniroy	Uniroy	Uniroy
24	Total H7CDF	30.0	pg/L	20.0	*	20.0	*	20.0	*	20.0	*	Uniroy	Uniroy	Uniroy
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	24.7	*	24.7	*	24.7	*	24.7	*	Uniroy	Uniroy	Uniroy
24	Octachlorodibenzofuran	30.0	pg/L	22.8	*	22.8	*	22.8	*	22.8	*	Uniroy	Uniroy	Uniroy
25	Oil and grease	1.0	mg/L	1.6	3.718	1.6	3.718	1.6	3.718	1.6	3.718	Uniroy	Uniroy	Uniroy

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - UNIROYAL CHEMICAL LTD. - ELMIRA

CONTROL POINT - CO 0900 Outfall #11 to River
AVERAGE FLOWRATE = 252 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	24	6.332	24	6.332	24	6.332	24	6.332	Uniroy	Uniroy	Uniroy
4	Ammonia plus Ammonium	0.25	mg/L	0.19	0.048	0.19	0.048	0.19	0.048	0.19	0.048	Uniroy	Uniroy	Uniroy
4	Nitrate+Nitrite	0.25	mg/L	1.69	0.402	1.69	0.402	1.69	0.402	1.69	0.402	Uniroy	Uniroy	Uniroy
4	Total Kjeldahl Nitrogen	0.5	mg/L	0.84	0.236	0.8	0.236	0.8	0.236	0.8	0.236	Uniroy	Uniroy	Uniroy
5	DOC	0.5	mg/L	6.1	1.724	6.1	1.724	4.4	1.109	4.4	1.109	Uniroy	Esso	Esso
5	TOC	5	mg/L	7.02	1.522	7	1.522	5	1.260	5	1.260	Uniroy	Esso	Esso
6	Total phosphorus	0.10	mg/L	0.16	0.049	0.16	0.049	0.16	0.049	0.16	0.049	Uniroy	Uniroy	Uniroy
8	Total suspended solids	5	mg/L	11	2.853	11	2.853	5	1.260	5	1.260	Uniroy	P1774	P1774
8	Volatile suspended solids	10	mg/L	4	1.017	4	1.017	4	1.017	4	1.017	Uniroy	Uniroy	Uniroy
9	Aluminum	30.0	ug/L	160.5	0.064	160.5	0.064	47.0	0.012	47.0	0.012	Uniroy	RREL	RREL
9	Boron	50.0	ug/L	35.8	0.009	35.8	0.009	35.8	0.009	35.8	0.009	Uniroy	Uniroy	Uniroy
9	Copper	10.0	ug/L	11.0	0.003	11.0	0.003	11.0	0.003	11.0	0.003	Uniroy	Uniroy	Uniroy
9	Zinc	10.0	ug/L	38.7	0.011	38.7	0.011	38.7	0.011	38.7	0.011	Uniroy	Uniroy	Uniroy
12	Mercury	0.10	ug/L	0.08	*	0.08	*	0.08	*	0.08	*	Uniroy	Uniroy	Uniroy
14	Phenolics (4AAP)	2.0	ug/L	9.3	0.002	9.3	0.002	2.5	0.001	2.5	0.001	Uniroy	Esso	Esso
15	Sulphide	20.0	ug/L	37.3	0.010	37.3	0.010	37.3	0.010	37.3	0.010	Uniroy	Uniroy	Uniroy
16	Bromodichloromethane	0.8	ug/L	0.4	0.0001	0.4	0.0001	0.4	0.0001	0.4	0.0001	Uniroy	Uniroy	Uniroy
16	Chloroform	0.7	ug/L	1.2	0.001	1.2	0.001	1.2	0.001	1.2	0.001	Uniroy	Uniroy	Uniroy
16	Methylene chloride	1.3	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Uniroy	Uniroy	Uniroy
17	Benzene	0.5	ug/L	0.4	0.001	0.4	0.001	0.4	0.001	0.4	0.001	Uniroy	Uniroy	Uniroy
17	Toluene	0.5	ug/L	229.1	0.042	229.1	0.042	5.4	0.001	5.4	0.001	Uniroy	Esso	Esso
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	5.1	0.002	5.1	0.002	5.1	0.002	5.1	0.002	Uniroy	Uniroy	Uniroy
24	Total H6CDD	30.0	pg/L	81.0	*	81.0	*	81.0	*	81.0	*	Uniroy	Uniroy	Uniroy
24	Total H7CDD	30.0	pg/L	159.3	*	159.3	*	159.3	*	159.3	*	Uniroy	Uniroy	Uniroy
24	Total H7CDF	30.0	pg/L	475.0	*	475.0	*	475.0	*	475.0	*	Uniroy	Uniroy	Uniroy
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	132.5	*	132.5	*	132.5	*	132.5	*	Uniroy	Uniroy	Uniroy
24	Octachlorodibenzofuran	30.0	pg/L	450.3	*	450.3	*	450.3	*	450.3	*	Uniroy	Uniroy	Uniroy
25	Oil and grease	1.0	mg/L	2.8	0.973	2.8	0.973	2.8	0.973	2.8	0.973	Uniroy	Uniroy	Uniroy

* - Less than 1 gram per day

COMPARISON OF CURRENT AND PROJECTED DISCHARGES

PLANT SITE - UNIROYAL CHEMICAL LTD. - ELMIRA

CONTROL POINT - OT 0200 Outfall #2 to River
AVERAGE FLOWRATE = 721 M3/DAY

				12 MONTH AVERAGE		BAT OPTION 1 ANNUAL AVERAGE		BAT OPTION 2 ANNUAL AVERAGE		BAT OPTION 3 ANNUAL AV RAGE		DATA SOURCE		
ATG	PARAMETER	RMDL	UNIT	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	CONC	LOAD KG/DAY	BAT 1	BAT 2	BAT 3
1	COD	10	mg/L	-	-	-	-	-	-	-	-			
2	Cyanide Total	0.005	mg/L	-	-	-	-	-	-	-	-			
4	Ammonia plus Ammonium	0.25	mg/L	0.08	0.062	0.08	0.062	0 08	0.062	0.08	0.062	Uniroy	Uniroy	Uniroy
4	Nitrate+Nitrite	0.25	mg/L	4.50	3.036	4.50	3.036	4.50	3.036	4.50	3.036	Uniroy	Uniroy	Uniroy
4	Total Kjeldahl Nitrogen	0.5	mg/L	2.1	0.507	2.1	0.507	2.1	0.507	2.1	0.507	Uniroy	Uniroy	Uniroy
5	DOC	0.5	mg/L	4.6	2.301	4.6	2.301	4.6	2.301	4.6	2.301	Uniroy	Uniroy	Uniroy
5	TOC	5	mg/L	3	4.126	3	4 126	3	4.126	3	4.126	Uniroy	Uniroy	Uniroy
6	Total phosphorus	0.10	mg/L	0.10	0.089	0.10	0.089	0.10	0.089	0.10	0.089	Uniroy	Uniroy	Uniroy
8	Total suspended solids	5	mg/L	10	7.949	10	7.949	10	7.949	10	7.949	Uniroy	Uniroy	Uniroy
8	Volatile suspended solids	10	mg/L	-	-	-	-	-	-	-	-			
9	Aluminum	30.0	ug/L	48.3	0.057	48.3	0.057	48.3	0.057	48.3	0.057	Uniroy	Uniroy	Uniroy
9	Boron	50.0	ug/L	42.8	0.031	42.8	0.031	42.8	0.031	42.8	0.031	Uniroy	Uniroy	Uniroy
9	Copper	10.0	ug/L	16.8	0.027	16.8	0.027	16.8	0.027	16.8	0.027	Uniroy	Uniroy	Uniroy
9	Zinc	10.0	ug/L	10.5	0.009	10.5	0.009	10.5	0.009	10.5	0.009	Uniroy	Uniroy	Uniroy
12	Mercury	0.10	ug/L	0.07	*	0.07	*	0.07	*	0.07	*	Uniroy	Uniroy	Uniroy
14	Phenolics (4AAP)	2.0	ug/L	3.4	0.003	3.4	0.003	3.4	0.003	3.4	0.003	Uniroy	Uniroy	Uniroy
15	Sulphide	20.0	ug/L	-	-	-	-	-	-	-	-			
16	Bromodichloromethane	0.8	ug/L	-	-	-	-	-	-	-	-			
16	Chloroform	0.7	ug/L	-	-	-	-	-	-	-	-			
16	Methylene chloride	1.3	ug/L	-	-	-	-	-	-	-	-			
17	Benzene	0.5	ug/L	0.2	*	0.2	*	0.2	*	0.2	*	Uniroy	Uniroy	Uniroy
17	Toluene	0.5	ug/L	0.7	*	0.7	*	0.7	*	0.7	*	Uniroy	Uniroy	Uniroy
19	Bis(2-ethylhexyl) phthalate	2.2	ug/L	-	-	-	-	-	-	-	-			
24	2,3,7,8 TCDD	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total TCDD	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total TCDF	15.0	pg/L	-	-	-	-	-	-	-	-			
24	Total PCDF	15.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H6CDD	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H6CDF	20.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H7CDD	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Total H7CDF	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Octachlorodibenzo-p-dioxin	30.0	pg/L	-	-	-	-	-	-	-	-			
24	Octachlorodibenzofuran	30.0	pg/L	-	-	-	-	-	-	-	-			
25	Oil and grease	1.0	mg/L	1.7	1.087	1.7	1 087	1.7	1.087	1.7	1.087	Uniroy	Uniroy	Uniroy

* - Less than 1 gram per day

IDENTIFICATION OF BAT OPTION DATA SOURCE ABBREVIATIONS

Akzo	-	Akzo Chemicals Ltd. Sarnia
Amoco	-	Amoco Canada Resources Ltd. Sarnia
BASFAm	-	BASF Fibres Arnprior
BASFS	-	BASF Canada Inc. Sarnia
B.F.G	-	B.F. Goodrich Canada Inc. Thorold
Canoxy	-	Canadianoxy Chemicals Ltd. Fort Erie
Cel	-	Celanese Canada Inc. Millhaven
Chin	-	Chinook Group Ltd. Sombra
Corn	-	Cornwall Chemicals Ltd. Cornwall
Crtcorn	-	Courtaulds Fibres Canada Cornwall
Crtna	-	Courtaulds North America Lemoyne, AL
Dow Mid	-	Dow Chemical Midland, MI
DowS	-	Dow Chemical Canada Inc. Sarnia
DupC	-	Du Pont Canada Inc. Corunna
DupK	-	Du Pont Canada Inc. Kingston
DupM	-	Du Pont Canada Inc. Maitland
DupW	-	Du Pont Canada Inc. Whitby
Esso	-	Esso Chemical Canada Sarnia
Ethyl	-	Ethyl Canada Inc. Corunna
Ethyl (P)	-	Ethyl's Proposed Treatment System
GE	-	G.E. Plastics Canada Ltd. Cobourg
Guard	-	Guardsman Products Ltd. Cornwall
Morbern	-	Morbern Inc. Cornwall
Nova	-	Novacor Chemicals Ltd. Mooretown
OCPSF	-	OCPSF Final Regulation
P415	-	Public Record Plant No. 415
P913	-	Public Record Plant No. 913
P1774	-	Public Record Plant No. 1774
Petref	-	MISA Petroleum Refining Document
Poly	-	Polysar Ltd. Sarnia
Polysar	-	Polysar Ltd. Sarnia
PR0200	-	Esso MISA Control Point PR 0200
R&H-M	-	Rohm and Haas Canada Ltd. Morrisburg
R&H-S	-	Rohm and Haas Canada Ltd. West Hill
RMDL	-	Regulation Method Detection Limit
RMDL/Intake	-	Regulation Method Detection Limit/Intake Water Levels
RREL	-	Version No. 4 RREL Treatability Data Base
Stepan	-	Stepan Canada Longford Mills
Uniroy	-	Uniroyal Chemical Ltd. Elmira
415P	-	Public Record Plant No. 415 - Public Comment Submission
415T	-	Public Record Plant No. 415 - Twelve Plant Study
725T	-	Public Record Plant No. 725 - Twelve Plant Study
913P	-	Public Record Plant No. 913 - Public Comment Submission
2680T	-	Public Record Plant No. 2680 - Twelve Plant Study